Ti300U, Ti400U, Ti401U, Ti480U

Thermal Imagers

Users Manual

9/2023 (English)

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Introduction

The Fluke Ti300U, Ti400U, Ti401U and Ti480U Thermal Imagers (the Product or Imager) are handheld, infrared imaging cameras for use in a variety of applications. These applications include equipment troubleshooting, preventive and predictive maintenance, building diagnostics, research and development.

The Imager displays thermal images on a high-visibility, industrial-quality LCD touch screen. The Imager can save images to a removable memory card. Saved images and data on the memory card can be transferred directly to a PC via the USB port or copied to a PC or other mobile device using a Micro-SD card reader.

The Imager includes SmartView™ software - a professional thermal analysis software. The SmartView IR is a high-performance, professional thermal image analysis software for thermal image analysis, fully-radiometric video analysis and professional thermal image reporting.

A rugged, rechargeable lithium-ion smart battery provides power to the Imager. The included AC power adapter can also be used to power the Imager directly and to charge the battery.

How to Contact Fluke

Fluke Corporation operates worldwide. For local contact information, go to our website: cn.fluke.com (Chinese) or www.fluke.com (English)

To register your product, view, print, or download the latest manual or manual supplement, go to our website.

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Safety Information

General Safety Information is in the printed Safety Information document that ships with the Product and at www.fluke.com. More specific safety information is listed where applicable.
A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

⚠ Caution

Storage and/or continual operation of the Imager in extreme ambient temperature conditions can result in temporary interruption of operation. If this occurs, let the Imager stabilize (cool down or warm up) before you resume operation.

Product Familiarization

The manual explains features for multiple models. Because models have different features, not all of the information in the manual may apply to your Imager. Use *Table 2* to identify the features of your Imager.

Standard Packaging

To prevent damage during shipment, the Product is shipped in a specially designed package. Please check the Product carefully and inform the carrier of any damage.

When unpacking the Product, please check the standard equipment listed in *Table 1* and other ordered parts listed on the packing list. If there is any shortage of parts, please inform the nearest Fluke Technical Service Center or the Service Center in place of purchase.

Figure 1 and *Table 1* list the standard equipment that comes with the Product. See *Optional Lenses* for optional lenses.

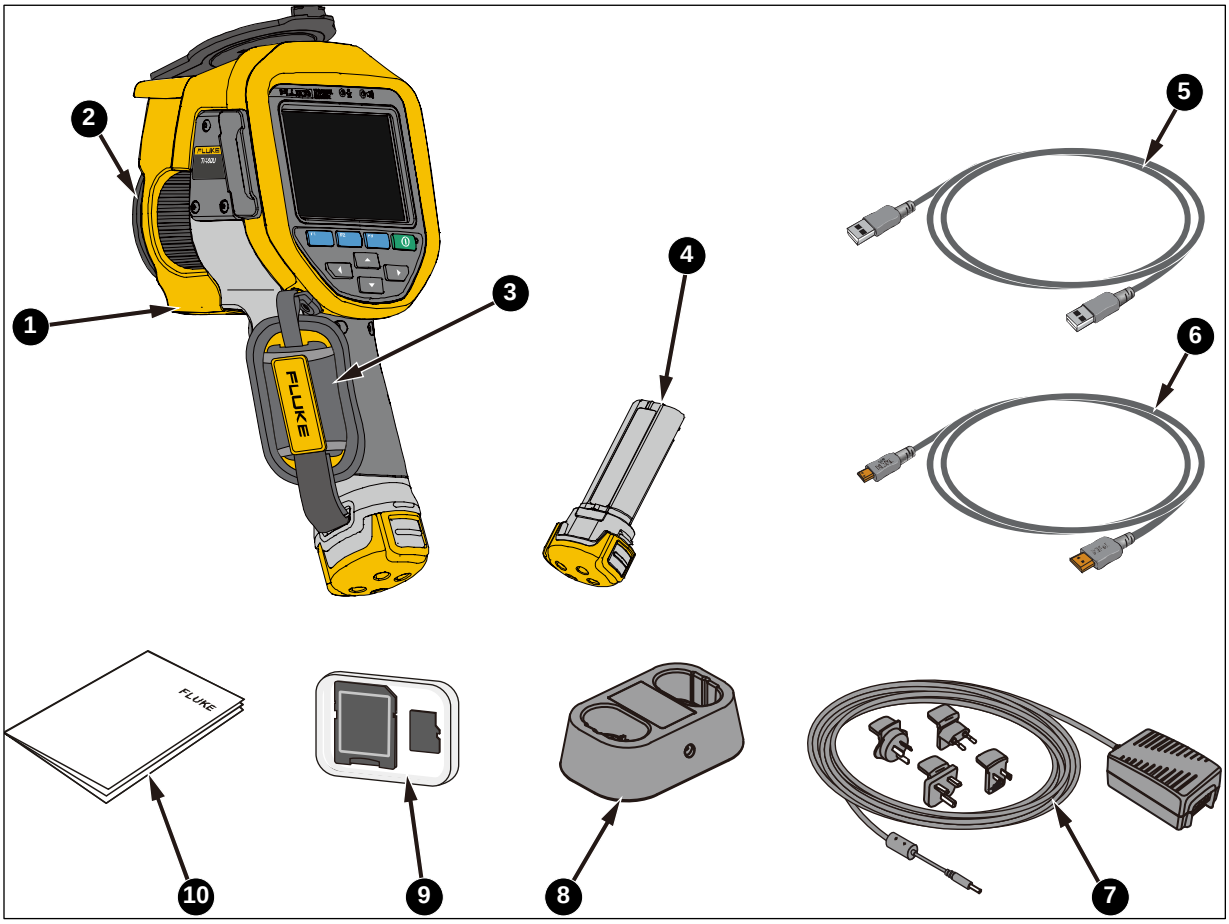


Figure 1. Standard Equipment

Table 1. Standard Equipment

Item	Description	Quantity
1	The Thermal Imager	1
2	Lens	1
3	Hand strap	1
4	Rechargeable Li-ion battery	2
5	USB cable, Type A - Type A	1
6	HDMI video cable, 1 m	1
7	Power adapter	1
8	2-bay battery charging base	1
9	Micro-SD memory card, 32 GB, with adapters	1
10	Included documentation, including a Safety Information, a Quick Reference Guide, a Certificate of Conformity, and a Warranty Card	1
Not shown	Hard carrying case	1

Model Comparison Table

Table 2 lists features of different models.

Table 2. Model Comparison Table

Features	Ti480U	Ti401U	Ti400U
Temperature Measurements			
Temperature span	-20 °C to 1200 °C	-20 °C to 650 °C	
Temperature range			
Range 1	-20 °C to 120 °C	-20 °C to 120 °C	
Range 2	0 °C to 650 °C	0 °C to 650 °C	
Range 3	300 °C to 1200 °C	—	
Imaging Performance			
IR resolution	640 × 480		384 × 288
SuperResolution	1280 × 960	—	
Minimum imaging distance	0.25 m		0.1 m
Digital zoom	1X to 10X		1X to 4X
Capture Features			
Image freeze	Single-frame capture and fully-radiometric video recording	Single-frame capture	Single-frame capture and fully-radiometric video recording
Fully-radiometric video recording	Support thermal video recording for analysis	—	Support thermal video recording for analysis
Non-radiometric video recording	Support thermal video, visible light video recording (only for viewing, not for analysis)	—	Support thermal video, visible light video recording (only for viewing, not for analysis)
IR-PhotoNotes annotation	5 images	2 images	
Data Connections			
Remote display via software	Yes	—	—
Remote operation via software	Yes	—	Yes

Operation Features

This section describes each component of the Product and each item on the screen and its functions. Read this section carefully before you use the Product.

Components and Controls

For components and controls on the front of the Imager, see *Figure 2*. *Table 3* lists the features and functions of each component.

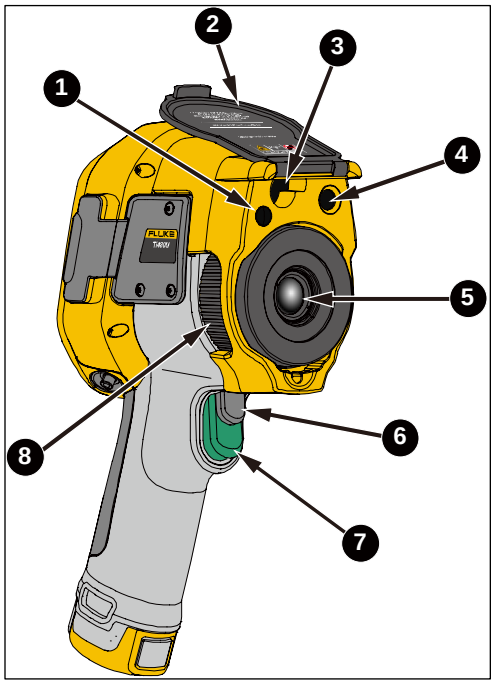


Figure 2. Front

Table 3. Front-Panel Features of the Product

Item	Name	Description
1	**LED Torch/Flashlight**	Use to identify the target in dark environment.
2	**Lens Cover**	Retractable lens cover
3	**Laser Pointer/Distance Finder**	Laser-assisted auto-focus and distance test.
4	**Visible Light Camera Lens**	5 megapixels
5	**Infrared Camera Lens**	Standard lens
6	**Secondary Trigger**	**Auto Focus Button** In the live image screen, push the Secondary Trigger and the Imager will automatically focus and shows a clear thermal image. See *Focus*.

Item	Name	Description
❼	**Primary Trigger**	**Image Capture Button** The function of the button depends on the capture mode: **Single Frame Mode:** 1. In the live image screen, pull and release the Primary Trigger to freeze the image. 2. In the freeze state, pull and release the Primary Trigger again to save the thermal image to the Micro-SD memory card. **Time-Lapse mode:** 1. Pull and release the Primary Trigger to start time-lapse capture. 2. In time-lapse mode, pull and release the Primary Trigger to stop capturing. **Recording (IS5) mode:** 1. In the live image screen, pull and release the Primary Trigger to start recording a video. 2. During recording, pull and release the Primary Trigger again to stop recording. Now, you can replay and/or edit the video. 3. Pull and release the Primary Trigger to save the video. **Recording (MP4) mode:** 1. In the live image screen, pull and release the Primary Trigger to start recording a video. 2. During recording, pull and release the Primary Trigger again to stop recording and save the video to the Micro-SD memory card.
❽	**Manual Focus Control**	Rotate the Manual Focus Control clockwise or counterclockwise until the inspection object is in proper focus

Figure 3 shows the back of the Product. *Table 4* lists the features and functions of each component.

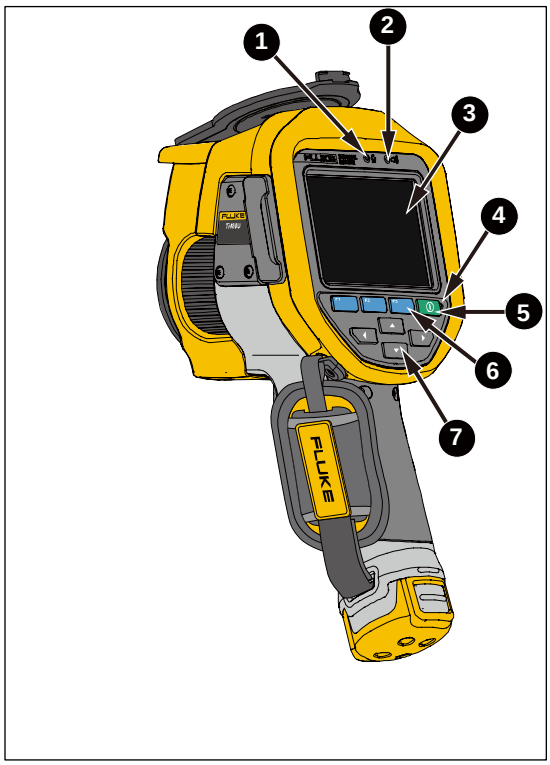


Figure 3. Back

Table 4. Back-Panel Features of the Product

Item	Name	Description
❶	**Microphone**	Records voice annotations.
❷	**Speaker**	Plays audio files or voice annotations and sounds the over-limit alarm for high/low temperature.
❸	**LCD Touchscreen**	3.5-inch LCD touchscreen
❹	**Power Indicator**	The power indicator has these states: - Off during normal operation. - Green during screen-off/reboot and shutdown process. - Blinking green during charging.
❺	**Power Button**	⏻ Power button functions are: - Push and hold for 2 s to turn on the Product or restart or shut down the Product as prompted on the screen. - When the Product is on, push the button briefly to put the Product in stand-by mode. - In the stand-by mode, push the button briefly to wake up the Product. - Push and hold for more than 7 s to force the Product to power off.

Item	Name	Description
❻	**Function Keys**	F1 F2 F3 The function keys F1 to F3 correspond to the softkeys from left to right at the bottom of the screen, so the corresponding function keys are equivalent to the soft keys. During operation, the label of the soft key varies depending on the function and interface. During operation, not all 3 softkeys have labels. If there is no label on a softkey, then the key has no function. Except on the Home screen, F1 usually acts as **Confirm** or **Select**; F2 usually acts as **Back**, which is used to return to the previous screen or menu; F3 usually acts as **Cancel**, which will exit the menu directly and return to the Home screen. When no softkeys show on the screen, use F2 and F3 as operation shortcuts: - F2: **Menu Key**. Push briefly to bring up the system menu. See *System Menu* for details. - F3: **Calibration Key**. Push and hold for at least 2 s and the Product automatically calibrates.
❼	**Navigation Keys**	▲ ▼ ◀ ▶ Use these keys to move the cursor and select an option. In Manual Temperature Scale mode, you can use these keys to adjust the temperature scale and temperature values.

Connections and Power Supply

For the connections and power supply of the Imager, see *Figure 4*. *Table 5* lists connections and power supply features and functions.

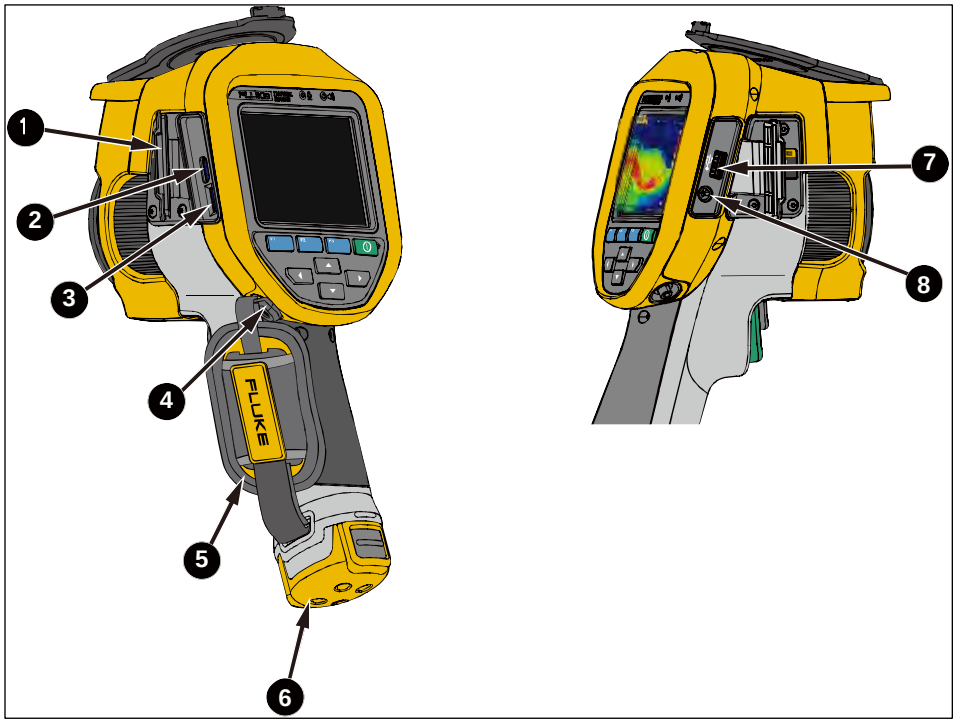


Figure 4. Connections and Power Supply

Table 5. Connections and Power Supply

Item	Name	Description
1	**Connector Cover**	
2	**HDMI interface**	Mini HDMI video interface
3	**SD card slot**	Micro-SD memory card slot
4	**Hand Strap Anchor**	Use the anchor to secure the hand strap provided with the Product. The hand strap can effectively improve handheld stability and comfort
5	**Hand Strap**	Makes the Product easy to carry and comfortable to use.
6	**Battery Pack**	Lithium battery
7	**USB (Type-A) Cable Connection**	Type-A USB 2.0 Interface
8	**Power Supply Connector**	AC Adapter/ Charger Input Terminal, 15 V DC

Touch Screen

The touch screen is a shortcut to the most used settings. To change parameters or select functions and options, tap the target area on the display.

In addition to images/videos and menus, current measurement data, environmental data, and device status information are shown in the Main Display Area in the form of **On-Screen Display** (for details on On-Screen Display, see *System Menu*). The screen shows different content based on the current operating mode and position, as detailed in the relevant sections below.

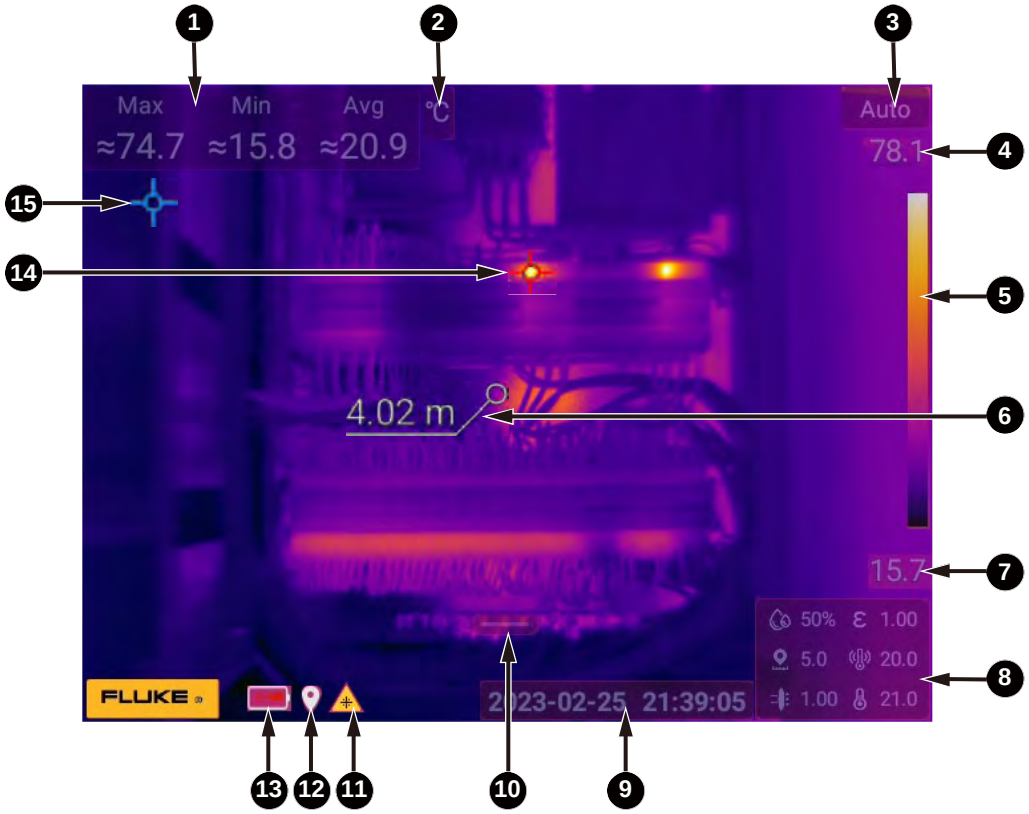


Figure 5. Screen

Note

Not all information is always shown on screen, to customize the information that shows, see Settings.

Table 6. Screen

Item	Description
1	**On-screen Display** Based on the system settings, global maximum, minimum and average temperatures, as well as spot, line and box temperatures for measurement analysis can be shown.
2	**Temperature Unit** See *Settings* for details.

Item	Description
❸	**Temperature Scale Mode** The Imager is available in both Auto and Manual Scale modes. See *Settings* for details.
❹	**Upper Temperature Limit** The highest temperature shown on the palette. See *Settings* for details.
❺	**Temperature Bar** Shows the corresponding relationship between temperature and palette color.
❻	**Target Distance** When **Menu -> Settings-> Memory -> Save Laser Distance** is set to “ON”, the screen shows the measured distance from the Imager to the target.
❼	**Lower Temperature Limit** The lowest temperature shown on the palette. See *Settings* for details.
❽	**Temperature Measuring Parameters** Relevant temperature measuring parameters are shown. See *Parameters* for details.
❾	**Time and Date** Current clock date and time.
❿	**System Menu Keys** Enter the system menu, where you can set capture mode, image mode, parameters, alarms, and system settings. See *System Menu* for more information.
⓫	**Laser Pointer/Distance Finder** The laser pointer is on.
⓬	**GPS Status** The GPS function is on. See *Settings* for details.
⓭	**Battery Status** See *Battery Care* and *Charge Batteries* for details on batteries.
⓮	**Maximum Temperature Point** The maximum temperature point on the screen (red bullseye cursor)
⓯	**Minimum Temperature Point** The minimum temperature point on the screen (blue bullseye cursor)

Shortcut Menus

Swipe down from the top of the screen to bring up a set of shortcut menus, as shown in *Figure 6*, for quick access to frequently used functions.

The features and functions of each button in the shortcut menu are described in *Table 7*.

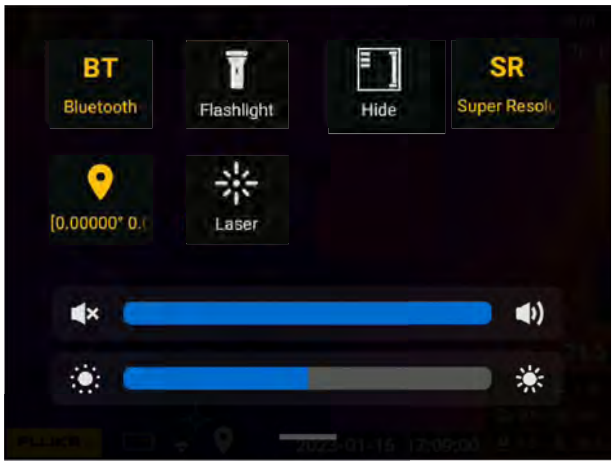


Figure 6. Keys on the Screen

Table 7. Touch Key Functions

Item	Description
❶	 **Bluetooth** Enable or disable the wireless Bluetooth function.
❷	 **Flashlight** Turn on or off the LED flashlight on the front of the Imager.
❸	 **On-Screen Display** Show or hide all on-screen display. Users can customize the information that shows on the screen, see *Settings* for details on how to customize.
❹	 **SuperResolution** Enable/disable the SuperResolution function, which can increase the pixels of the captured thermal image by 4 times. It is disabled by default.

Item	Description
5	 **GPS** Enable/disable the GPS function.
6	 **Laser** Turn on or off the Laser Pointer/Distance Finder. When the laser is on, the laser icon is yellow (), and the laser status indicator () shows on the screen; when the laser is off, the icon is white ().
7	 **Volume Control**
8	 **Brightness Control**

⚠⚠ Warning

To prevent eye damage or personal injury:

- **Do not look into the laser. Do not point laser directly at persons or animals or indirectly off reflective surfaces.**
- **Do not disassemble the Product. The laser beam is dangerous to eyes. Have the Product repaired only through an approved technical site.**

Basic Operation

Turn On and Off the Imager

Before you use the Imager for the first time, charge the battery for a minimum of 2 ½ hours. See *Charge Batteries* for more information on battery charging.

To turn on or turn off the Imager, push and hold ⏻ for 2 seconds.

To maximize the life of the battery, use the Power Save features. See *Settings* for more information about how to set these features.

When the Product is turned on, push and hold ⏻ for 2 seconds, the Power menu will pop up on the screen. The menu options are:

- **Reboot** The Imager will shut down and then restart.
- **Power Off:** Turn off the Imager.
- **Cancel**: to exit the menu.

Note

If the Imager crashes, push and hold ⏻ for more than 7 seconds to force a shut down.

Note

All thermal imagers need sufficient warm-up time for accurate temperature measurements and best image quality. Warm-up time can vary by model and environmental conditions. Wait a minimum of 20 minutes if the most accurate temperature measurement is important to your application. When you move an Imager between environments with large differences in ambient temperature, allow for additional adjustment time.

Within 15 minutes after startup, the "≈" symbol shows before the temperature value on the screen to indicate that the Product is still in the warm-up period, and the temperature value is only for reference.

Stand-by and Wake-up

When the Product is on, push ⏻ briefly to put the Product in stand-by mode.

In stand-by mode, the screen is off and only ⏻ is available; the Imager remains powered on and warmed up.

In stand-by mode, push ⏻ and the Imager quickly enters the operating state.

Focus

Make sure that the infrared energy is correctly directed onto the pixels of the detector. Without correct focus, the thermal image can be blurry, and the radiometric data might be inaccurate.

To focus with the advanced manual focus system, rotate the Manual Focus Control (❽ in *Figure 2*) until the inspection object is in proper focus.

Capture and Save Image

To capture an image:

1. Focus on a target, see *Focus*.
2. Pull and release the Primary Trigger (green) to freeze the image. The image is in the memory buffer for you to save or edit the image.

   Now the Imager shows the captured image and a menu bar.

   To edit an image, push F2. For more information about editing images, see *Thermal Image/ Video Analysis*.
3. Pull and release the Primary Trigger again, or push F1, the image will be saved to the Micro-SD memory card and the Imager will go back to the live view.

For the settings of capturing thermal images in different modes, refer to *Image Mode*; for the settings of capturing fully-radiometric videos, please refer to section *Capture Mode*;

For fully-radiometric video and time-lapse mode, the method is similar to the one above. For details on how to use the Primary Trigger, see *Table 3*.

Digital Zoom

Use the Imager's Digital Zoom function to zoom in/out the live or saved thermal image being viewed.
In the area of an image on the screen:

- **Zoom In**: Tap the screen with two fingers and spread them outward.
- **Zoom Out:** Tap the screen with two fingers and pinch them together.
- Use two fingers, when the wheel appears at the bottom of the screen, you can slide the wheel to zoom in/out.

In Live Image mode, a zoom factor shows at the bottom of the screen, as shown in *Figure 7*. Push F3 to hide the scroll wheel and display only the zoom factor. If the factor is 1.0 the zoom factor does not show.

Figure 7. Zoom In/Out Images

System Menu

Use the System Menu to change and view settings.
On the Home screen, tap — or push F2, the Main System Menu will show. *Table 8* lists a brief description of each menu icon in the Figure.

Note

When using the System Menu, if — does not show on the screen, or F2 does not respond, check the on-screen display settings and close ***Hide*** *(Hide). For the on-screen display settings, see* Shortcut Menus*.*

Table 8. System Menu

Item	Description
Temp Range	The Imager provides 3 temperature ranges and 1 intelligent range: - -20 °C to 120 °C - 0 °C to 650 °C - 300 °C to 1200 °C (Ti480U only) - Intelligent Range. The Imager automatically selects the appropriate temperature range based on the temperature of the field of view. For on-site temperature measurement, you must set an appropriate temperature range in advance. If the on-site temperature is outside the selected temperature range, a “<” or ">" symbol shows with the temperature on the screen; and a “<” or ">" symbol shows along the upper or lower limit of the temperature bar.
Image Mode	Image modes supported include: - IR thermal image - Visible light image - PIP - T-DEF Fusion (the transparency of infrared images can be adjusted)
Capture Mode	The available capture modes include: - Single Frame - Time Lapse - Recording (The video format can be set to .IS5 or .MP4 in **Menu > Settings > Memory**)
ROI	The operation options provided include: - Adding a temperature measurement region (ROI), including Adding Point (Sp) Adding Line (Li) Adding Rectangle (Ar) Adding Circle (Ci) T-Rise - Clear all ROI - Select ROI - Display Settings: Maximum temperature Minimum temperature Average temperature Emissivity

Item	Description
Camera	Set focus mode: - Auto focus You can select: Laser Contrast - Continuous auto focus You can select: On Off
Gallery	Users can browse and analyze thermal images or fully-radiometric videos in the Gallery.
Parameters	The correction parameters that can be set include: - Emissivity. It is 0.95 by default. - Reflection Temperature. It is 20 °C by default. - Ambient Temperature. It is 20 °C by default. - Temperature Scale Mode. You can select: Auto Manual - Humidity. It is 50 % by default. - Measurement Distance. It is 1.0 m by default. - IR Window Compensation. Choose enabled or disabled. When enabled, you can set: Ambient Temperature Optical Transmittance
Palettes	Go to the Palettes submenu and select a palette.
Settings	**System Settings** See *Settings* for details.

Menu Actions

In addition to accessing menus by tapping the screen, you can also access menus with the navigation keys.

1. Use the navigation keys (▲ ▼ ◀ ▶) to move the cursor (yellow) over the corresponding option.
2. Push F1 (**Select/Confirm**) to go to the next menu level or to check and select settings.
3. Push F2 (**Last**) to return to the previous menu, or push F3 (**Cancel**) to exit the menu.

Image Mode

Image Modes supported by the Imager include Thermal, Digital Camera, Picture-in-Picture and T-DEF Fusion.

The Image Mode menu is as shown in *Table 9*.

Table 9. Image Mode

Item	Description
Thermal	In this mode, the screen shows infrared images; infrared images with temperature data are captured and saved.
Digital Camera	In this mode, the screen shows visible light images captured by the digital camera.
Picture-in-Picture	In this mode, an infrared thermal image is superimposed on a digital photo. See *Picture-in-Picture* for details.
T-DEF Fusion	This mode is a fusion mode of visible light images and infrared thermal images, you can adjust the blending degree. See *T-DEF Fusion* for details.

Picture-in-Picture

In Picture-in-Picture mode, an infrared thermal image is superimposed on a visible digital photo, as shown in *Figure 8*.

Figure 8. Picture-in-Picture

Click on the thermal image in the center of the screen to select the image, and a control point appears in each of the four corners of the thermal image, while a central control point is also displayed in the center of the screen.

Click on any control point in the four corners and drag it to change the size and shape of the thermal image. Click to select the central control point and drag it to move the position of the thermal image.

Note

In the picture-in-picture mode, make sure that the Imager is accurately focused. Otherwise, the temperature measurement accuracy of the Imager will be affected.

T-DEF Fusion

Figure 9. T-DEF Fusion

To adjust the blending degree:

1. In visible light mode, a blending adjustment wheel will appear on the lower half of the screen, and a percentage indicating blending degree shows above, as shown in *Figure 10*.

Figure 10. Blending Adjustment Wheel

2. Use your finger to slide the wheel left and right, observe the changes of the image, and adjust the blending degree of infrared and visible images.
3. To avoid the wheel interfering with the view of the image, push F3 and the wheel will disappear, but the percentage of blending remains on the screen.
4. If you need to adjust the blending degree again, tap the percentage on the screen with your finger and the wheel will appear again.

Capture Mode

The Imager provides a variety of capture modes to choose from. The Capture Mode menu is as shown in *Table 10*.

Table 10. Capture Mode Menu

Item	Description
Single Frame	Push Capture to take one image at a time.
Time-Lapse	Set the time interval for capturing.
Recording (IS5)	Record a video, the format can be set to fully-radiometric video (IS5), or to video of MP4 format. See *Settings* for details.

Single Frame

In Single Frame mode, only one image is saved for each capture. See *Image Mode* for information on Image Mode. See *Capture and Save Image* for how to capture images.

Time-Lapse

Before you enable the Time-Lapse function, you can set the time interval of capturing images and the total number of images to be captured in advance. The interval can be set at any time between 2 s and 60 m 59 s. The total number of images can be set to from 2 to 1000, or ∞.

To set the Time-Lapse:

1. On the Main System Menu, tap **Capture Mode**.
2. In the pop-up menu, tap **Time Lapse**.
3. Slide on the wheel displayed on the screen to select the corresponding minute and second values, as well as the total number of images to be captured, as shown in *Figure 11*.

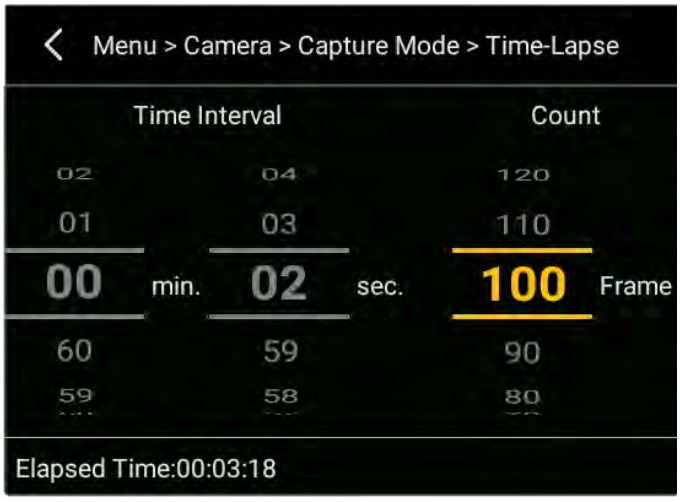


Figure 11. Time-Lapse

4. Push F3 (**Cancel**) to exit the menu.

Recording

The Imager support recording fully-radiometric (IS5) and non-radiometric (MP4) videos. See *Settings* for information about selecting the video format.

Fully Radiometric Video (IS5)

In Fully-Radiometric Video mode, pull the primary trigger to start recording. Pull and release the primary trigger again, to stop recording.

You can pre-set the frame rate for video recording, which can be set between 1 Hz and 9/16 Hz.

To set the Frame Rate:

1. On the Main System Menu, tap **Capture Mode.**
2. In the menu that pops up, tap **Recording (IS5)**.
3. Slide on the wheel shown above the icon to select an appropriate frame rate (FPS). It can be set to recording a video at a speed of 1-16 frames per second.

Non-Radiometric Video (MP4)

When the video format is set to MP4 and capture mode is set to recording, a non-radiometric video will be recorded.

1. On the Main System Menu, tap **Capture Mode**.
2. In the menu that pops up, tap **Recording (MP4)**.
3. Pull and release the Primary Trigger to start recording.
4. Pull and release the Primary Trigger again to stop recording and automatically save the file.

Temperature Measurement Region (ROI)

The Image comes with a set of measuring and analysis tools, such as the measurement of maximum/average/minimum temperatures and temperature differences in a specific region. ROI stands for Region of Interest.

ROI can be a circle, a rectangle, a line or a spot. The prefix on the saved name indicates the type of ROI; the prefix for a circle is **Ci**, the prefix for a rectangle is **Ar**, the prefix for a line is **Li**, and a prefix for a spot is **Sp**.

On-Screen display shows the ROI shape, name, the maximum temperature point and its temperature value, the minimum temperature point and its temperature value, average temperature and the emissivity of different ROIs.

The menu **ROI** is shown in *Table 11*.

Table 11. Measuring Tools

Item	Description
Adding Point	Add a spot measurement region (Sp).
Adding Line	Add a line measurement region (Li).
Adding Rectangle	Add a rectangle measurement region (Ar).
Adding Circle	Add a circle measurement region (Ci).
T-Rise	A temperature difference calculation tool, which can set the temperature difference calculation between a temperature measurement mark and the selected reference temperature value.
Clear all ROI	Delete all ROI with one tap.

Item	Description
Select ROI	Select an appropriate ROI.
Display Settings	It is used to select to display or hide the maximum temperature, the minimum temperature, average temperature and/or emissivity of the ROI on the screen.

Note

The Imager can add up to 16 movable spots, up to 12 ROIs (including rectangles or circles), and up to 8 movable lines.

Add a ROI

- In the ROI menu, tap the option to be added.

  The corresponding ROI is added directly in the center of the screen.

- Draw an ROI on the corresponding region in an image. The method for drawing a ROI varies slightly depending on the tool selected, as shown in *Table 12*.

Table 12. Draw a ROI

Tool	Methods
Add Rectangle	Tap to automatically add a rectangular ROI is to the image area, which is also marked with control points at its four corners. Tap another position in the thermal image, and the control point marks of the rectangle disappear, indicating that the rectangle is not currently selected. At the same time, the default name of the ROI is shown, which is in the form "Ar+number", where the number refers to the serial number of the rectangular ROI.
Add Circle	Tap to automatically add a oval ROI is to the image area and an oval ROI is created. The name of the oval ROI is prefixed with Ci.
Add Line	Tap to automatically add a temperature curve to the image area. The name of the temperature measurement line is prefixed with Li.
Add Spot	Tap to add a cross mark to the thermal image. The name is prefixed with Sp.

ROI Operation

After a ROI is established, a series of actions can be performed on the ROI:

Select an ROI

1. In the Temperature Measuring Tools menu, tap **Select ROI** and a list of all current ROIs is shown.
2. Swipe up and down in the ROI selection area to select the ROI to be adjusted.
3. Push F1 (**Select**).

   The selected ROI is highlighted.

   The **Edit** option shows at the bottom of the screen.

Move an ROI:

- Use the navigation button to move the selected ROI in 4 directions.

Or

- Tap and hold the central control point of the ROI to be moved directly on the touch screen and move it to the area that needs to be observed.

Adjust an ROI:

Tap and hold the ROI directly on the touch screen (just tap and hold one of the four control points on the ROI), and swipe up, down, left, and right on the touch screen to adjust the size of the ROI.

Set Temperature Alarm for ROI

The Imager provides audible alarms for high and low temperature of ROI, so you can set an upper and/or lower temperature limit. When the measured temperature of ROI is higher than the upper limit or lower than the lower limit temperature, a sharp and rapid beep alerts the inspector. After setting, a bell shows on the main interface. When alarming, the bell will flash blue at low temperature and red at high temperature.

To set an audible alarm:

1. Select the corresponding ROI, push F2 (**Edit**).
2. Select the **Alarm** option.
3. Select **High Temperature Alarm** or **Low Temperature Alarm** on the left side of the screen.
4. Select the alarm for **Upper Limit** or **Lower Limit**.
5. In the temperature value column, slide up and down to select an appropriate temperature value.
6. Select **Silent** or **Beep**.
7. Push F2 (**Last**) to return to the previous menu or push F3 (**Cancel**) to exit the menu.

Set the emissivity of a ROI

1. Select the appropriate ROI.
2. Push F2 (**Edit**).
3. Select **ROI Emissivity** option.

   An interface for customizing emissivity values and an emissivity table will appear on the screen. You can customize the emissivity values as needed or directly call the values in the emissivity table.

Delete a ROI

1. To delete a ROI, select the ROI and push F2 (**Edit**).
2. Select Delete a ROI.
3. Push F1 (**Confirm**).

Temperature Rise (T-Rise)

Users can set temperature difference calculation between a temperature measurement mark and a fixed reference temperature value.

To set temperature difference calculation:

1. In the **ROI** menu, select **T-Rise**. The temperature difference calculation setting interface shows.

   In the temperature difference calculation setting interface, the first column is the function switch, followed by **Target** and **Temp-Rise**.

   When the temperature difference function is enabled, the temperature shows as temperature difference on the main interface. The calculation formula is:

   - When the reference target is selected as the added marker, the temperature difference calculation is based on the selected marker. This can be the maximum, minimum and average values of the marker.
   - When the reference target is selected as the reference temperature, enter the reference temperature value in the third column. The temperature difference calculation is based on the set reference temperature value.

   At the same time, the temperature difference symbol and the selected reference target and its temperature value show at the top of the main interface.

2. Turn on the function switch.
3. Select **Target** and **Temp_Rise** as required.

   The options for **Target** can include, the maximum, the minimum and the average temperature of each ROI.

4. Push F2 (**Cancel**) to exit the menu.

Display Settings

Tap a button to show/hide the display of the corresponding information: a solid box (▣) means the information is shown, and a hollow box (□) means the information is not shown.

Camera

From this menu, you can set Autofocus and whether to select continuous autofocus.

To set Autofocus: Set Laser/contrast mode. Laser Autofocus is using a built-in laser to focus on a target, contrast Autofocus mode is using image processing algorithm to focus a target and get a sharp picture.

Gallery

You can browse or analyze thermal images or fully-radiometric videos in the Gallery.

The names of the thermal image files saved in the Gallery are at the bottom of the thumbnails. Depending on the Settings, the name can include:

- .jpg
- .mp4
- .is5

For information on customizing file name prefixes and selecting formats, see section *Settings*.

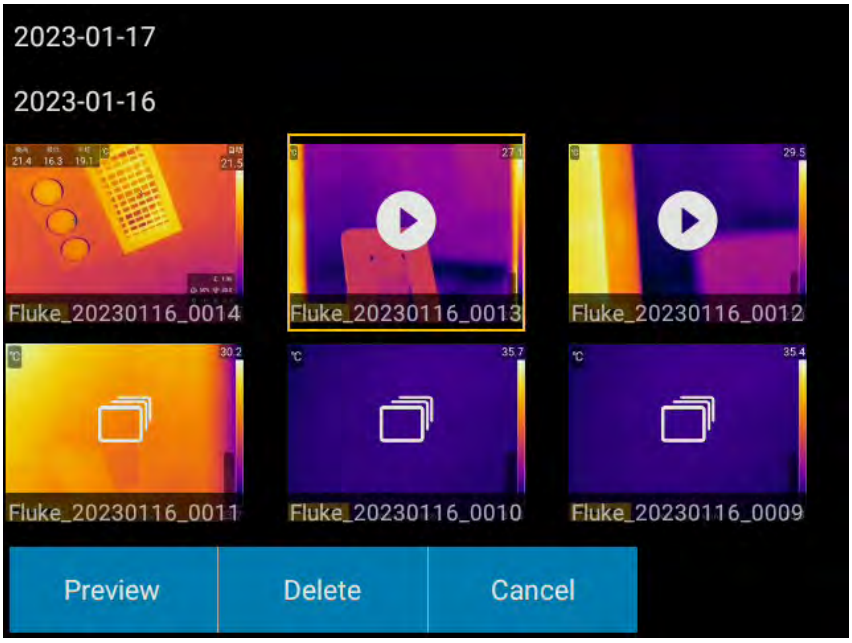


Figure 12. Gallery

To browse and select images:

Choose a method to open images or videos.

- Use navigation keys to select the image or video to be opened, and then push F1 (**Preview**).
- Double tap an image or video thumbnail on the screen.

Gallery Operation

Once an image or video is opened in the gallery, use F2 (**Edit**) to access the functions (available actions depend on the thermal image file selected):

Table 13. Gallery Menus

Item	Description
ROI	See *Temperature Measurement Region (ROI)* for details.
Image Mode	See *Image Mode* for details.
Parameters	See *Parameters* for details.
Palettes	See *Palettes* for details.
Text Annotation	Tap to open the text annotation input box. You can directly add and edit text information and automatically associate it with the thermal image. See *Text Annotation* for details.
Voice Annotation	Tap to open the sub-menu for voice annotation. You can directly record/play a voice annotation and automatically associate it with a thermal image. See *Voice Annotation* for details.
Tag	Tap to directly add and edit a tag and automatically associate the tag with the thermal image. See *Tag* for details.
File Property	Display image details, including recording time, file type, file size, resolution and storage path.

Parameters

The Parameters Menu is as shown in *Table 14*.

Table 14. Correction Parameters

Item	Description
Emissivity	The actual emissivity of the target under measurement.
Reflection Temperature	Change the background temperature to compensate for or correct the background thermal radiation reflected from the target under measurement.
Ambient Temperature	Environment temperature refers to the air temperature between the Imager and the target.
Select Scale Mode	Set temperature scale mode. See *Selecte Scale Mode* for details.
Humidity	The Imager can compensate for the local effects of air relative humidity on thermal radiation transmission.
Distance	The measurement distance refers to the distance between the target under measurement and the Imager's lens.
IR Window Compensation	When you do infrared inspections through IR windows, not all the infrared energy emitted from the target is transmitted through the optical material in the window.

Emissivity

Emissivity refers to the ratio of the energy radiated by the object under measurement to the energy radiated by a black body at the same temperature and wavelength, and it is between 0 and 1.

All objects radiate infrared energy. The actual surface temperature and emissivity of the target affects the quantity of energy radiated. The Imager senses the infrared energy from the surface of the target and uses the data to calculate an estimated temperature value. Many common materials such as wood, water, skin, cloth, and painted surfaces, including metal, radiate energy well and have a high emissivity factor of ≥90 % (or 0.90). The Imager measures temperatures accurately on targets with a high emissivity.

Shiny surfaces or unpainted metals do not radiate energy well and have a low emissivity factor of <0.60. For the Imager to calculate a more accurate estimate of the actual temperature of targets with a low emissivity, adjust the emissivity setting.

⚠⚠ Warning

To prevent personal injury, see emissivity information for actual temperatures. Reflective objects result in lower than actual temperature measurements. These objects pose a burn hazard.

The emissivity settings of this series Thermal Imagers are divided into Full-Image Emissivity Correction and Area Emissivity Correction. For the settings of the Area Emissivity Correction, see *Temperature Measurement Region (ROI)*.

To Set Full-Image Emissivity:

1. In the Parameters menu, select **Emissivity**.
2. To customize material emissivity, slide up and down the emissivity values (0.01 to 1.0) on the left side of the screen.
3. If the material of the target under measurement is known, you can slide up and down the Material Emissivity Reference Table on the right side of the screen to select the corresponding material.
4. Push F2 (**Last**) to return to the previous menu, or push F3 (**Cancel**) to exit the menu directly.

Reflection Temperature

Reflection Temperature compensates or corrects the reflected thermal radiation on the target under measurement. When the target is surrounded by very hot or very cold objects, the measurement accuracy may be affected, especially when the surface emissivity of the target is low. Adjust the reflected background temperature to improve measurement accuracy.

To set Reflection Temperature:

1. First use the Imager to test the actual temperature of reflectors near the target.
2. Select Reflection Temperature.
3. Slide the screen up and down to set the Reflection Temperature to the temperature value of the reflector measured by the Imager.
4. Push F2 (**Last**) to return to the previous menu, or push F3 (**Cancel**) to exit the menu.

Ambient Temperature

Ambient Temperature refers to the air temperature between the Imager and the target.

To set Ambient Temperature:

1. Select Ambient Temperature.
2. Slide the screen up and down to set Ambient Temperature value to the actual air temperature.
3. Push F2 (**Last**) to return to the previous menu or push F3 (**Cancel**) to exit the menu.

Note

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

Selecte Scale Mode

The thermal imager provides the scale modes: Auto Range and Manual Range.

In the Auto range mode, the Imager uses the algorithm to automatically set the appropriate upper/lower temperature value of the temperature span.

In the Manual range mode, the background of the upper/lower limit temperature values of the temperature bar is gray, which is in the adjustable state. When the upper and/or lower temperature value of the temperature bar have no gray background, they are in the locked state; Tap the upper/lower temperature value to switch it to the locked or adjustable state.

The minimum temperature span In the Auto span mode is 3 °C and 2 °C in the Manual mode. The imager supports touch selection and setting the upper and lower limit temperature values of the temperature span.

Select Temperature Span Mode：

1. Select **Select Scale mode** menu.
2. Tap **Auto** or **Manual**.
3. Push F2 (**Last**) to return the previous menu, or push F3 (**Cancel**) to exit the menu.

To adjust temperature span manually.

When the Manual temperature span mode is selected, a scroll wheel shows on the right side of the screen, as shown in *Figure 13*. Slide the scroll wheel up or down to adjust the temperature span or push ▲ / ▼.

Figure 13. Adjust temperature span manually

1. Tap the upper and/or lower limit temperature values as needed to make the background gray (for example 110.0).
2. Slide the scroll wheel on the right side of the screen to adjust the corresponding upper and/or lower limit.
   - When the background of upper limit temperature values is gray and the lower limit value has no background color, you can adjust the upper limit and the lower limit remains unchanged.
   - When the background of lower limit temperature values is gray and the upper limit value has no background color, you can adjust the lower limit and the upper limit remains unchanged.
   - When the background of the upper and lower limit are gray, the upper and lower limits can be adjusted simultaneously.

Humidity

The Imager can compensate for the local effects of air humidity on thermal radiation transmission. Therefore, it is necessary to set the humidity correctly.

To set Humidity:

1. Select **Humidity**.
2. Slide the screen up and down to set the Humidity percentage to the actual humidity value;
3. Push F3 (**Last**) to return to the previous menu, or push F3 (**Cancel**) to exit the menu.

Note

In the case of short distances and normal humidity, the humidity is usually set to the default value of the Imager.

Distance

The Distance refers to the distance that the Imager is from the target under measurement.

To set Distance:

1. Select **Distance**.
2. Slide the distance value on the screen up and down to set it to the actual distance between the target under measurement and the Imager.
3. Push F2 (**Last**) to return to the previous menu or press function key F3 (**Cancel**) to exit the menu directly.

Note

*If **Save Laser Distance** (in **Menu -> Setting -> Memory**) is set to "ON", the target distance is automatically set to the distance measured by the laser distance finder.*

IR Window Compensation

When infrared inspection is done through an infrared window, not all the infrared energy emitted by the target can pass through the optical material of the window. If the window transmittance is known, the transmittance percentage can be adjusted in the Image or the SmartView IR software to improve measurement accuracy.

Transmittance

External optical transmittance refers to the transmittance of any external lens or IR window used in front of the Imager.

To set Transmittance:

1. Measure the actual transmittance of external lens or external infrared windows.
2. In Parameters menu, select **IR Window Compensation**.
3. Set the IR Window Compensation function to **On**.
4. Slide up or down value of the **External Temperature** on the screen to set ambient temperature value to the actual air temperature.
5. Slide up or down the value of the **ExternalOptics Transmittance** on the screen (0.01 to 1.0) to set it to the actual values measured.
6. Push F2 (**Last**) to return to the previous menu or push F3 (**Cancel**) to exit the menu.

Note

If there are no external infrared windows, external optical transmittance is usually set to the default value (1.00) of the Imager.

Palettes

Use the palette function to select Palettes.

The Imager provides Grey, Iron10, Iron, Rainbow, Grey10, GreyRed, MidGrey, Yellow, Rain, and supports inverted palettes.

Settings

The System Settings menu mainly contains some system settings of the Imager itself, such as language and time, temperature and measurement units, communication options, storage options, and also device information, such as serial number, software and hardware version. This menu can also be used to restore the Imager to its factory settings if necessary.

Table 15. Settings Menu

Item	Option	Description
Display Settings	**Screen brightness**	Adjust the brightness of the screen backlight.
	Image Overlay	Set the information displayed on the Home screen. The information that can be set includes: • Global maximum temperature • Global minimum temperature • Global average temperature • Emissivity • Reflection Temperature • Ambient Temperature • Humidity • Distance • Line trend *Note* *The emissivity shown at the bottom right of the screen is the full-screen emissivity. Refer to* Temperature Measurement Region (ROI) *for ROI emissivity.*
Connection	**Bluetooth**	Push the Bluetooth button to enter Bluetooth sub-menu. Tap  on the touch screen. When Bluetooth is enabled, the button shows in yellow. Then tap **Headset**, select the Bluetooth headset or other Bluetooth device that can be searched to complete the pairing of Bluetooth devices. It is disabled by default.

Item	Option	Description
Instrument Setup	**Language, Time and Region**	**Language** Select the language to use on the display. The Imager currently supports Simplified Chinese, English, Japanese, Korean, and Traditional Chinese **Temperature Unit** - °C - K - °F **Distance Unit** - m - ft **Date** Set the year, month and day of the built-in calendar in the Imager. **Time** Set the time for the built-in clock in the Imager. **Time Zone** Select the local time zone. The default is GMT+08:00 Hong Kong/China. **Date Format** - yyyy-mm-dd - yyyy/mm/dd - mm/dd/yyyy - dd/mm/yyyy
	Geographical location	Turn on or off the GPS function. Default is off.
	LED torch/flashlight	On/Off
	Screen-off time	Users can select a time after which the screen turns off or never turn it off: - 5 minutes - 10 minutes - 30 minutes - Never
	Sound volume	Adjust the sound volume. Default is 70%.

Item	Option	Description
	Reset	Options are: - Parameters are reset to factory default settings. - Delete all saved files. See *Default Settings* for default settings of the Imager. *Note* *If you forget to modify some parameters during the test and it affects the imaging and temperature measurement accuracy. You can use the first method to reset the parameters to the factory defaults, and then the Imager will automatically restart.* *If you need to delete all test data from the Imager, use the second method, the Imager will delete all the files saved in the storage and they cannot be recovered. The Imager automatically restarts after the deletion.*
	About	**Model** The Imager's model. **Equipment No.** The Imager's number. **Software version:** The Imager's software version. **System version** The Imager's system version. **Operating system version** Operating system version number. **Sensor** The version number of the Sensor. **Lens** Lens focal length. **Battery Level** **Remining SD Card Capacity** **Status information** You can view the Bluetooth address. **System Upgrade...** Upgrade the system (upgrade package file is required).
Storage	**Super Resolution**	Turn on/off the SuperResolution function, which can increase the pixels of the captured thermal image by 4 times. Default is off.
	Video format	Options are: **IS5** or **MP4** format
	Save digital image as separate JPEG	On/Off

Item	Option	Description
	Digital Camera	Turn on/off the visible light camera Default is on. After the file is saved, the current visible image is stored.
	Save Laser Distance	On/Off When this option is On, the distance measured by the laser distance finder is used when taking pictures, and the distance will be displayed on the captured image.
	Delete All Saved Files	All files saved in the Imager will be deleted and cannot be recovered. Please use it with care.
	File name prefix	Users are allowed to customize the prefix of the saved file name.

Default Settings

Table 16 lists the default settings of the Imager.

Table 16. Default Settings

Item	Default		Item	Default
Temperature Unit	°C		ROI	Empty
Distance Unit	m		Display settings	On-Screen Max temperature: ON
Scale Mode	Auto		Parameters	
Save Laser Distance	Off		Emissivity	0.95
Data Format	yyyy-mm-dd		Reflected Temperature	20 °C
Auto focus	Contrast Thermal		Ambient Temperature	20 °C
Continuous Autofocus	Off		Humidity	50 %
Save digital image as separate	Off		Distance	1 m
SuperResolution	Off		IR window compensation	Off
Video Format	IS5		Palettes	Iron
Digital camera	ON		LED lamp as flash	Off
Filen Name Prefix	Fluke		Screen Off	5 min.
Image mode	Thermal		Image Overlay	On: On-Screen Max Temperature, Emissivity, Ambient Temperature, Distance. Other items are Off.
Capture Mode	Single Frame			

Thermal Image/ Video Analysis

The Imager provides many measuring and analysis tools on the screen freeze and gallery view interface. It can also accurately diagnose and analyze the target at test site without the PC-based analysis software.

Depending on Capture Mode, these types of images can be analyzed:

- Fully-Radiometric Images
- PIP Images
- Fully-Radiometric Videos

The thermal image/video is analyzed in almost the same way, whether it is the frozen image while capturing or an existing file opened from the gallery.

The section below takes the frozen image while capturing as an example to introduce the thermal image/video analysis. For the analysis of thermal images/videos in the gallery, the differences, if any, will be introduced in the form of prompts.

Thermal Image

In the image freeze interface under the Thermal mode, push F2 (**Edit**), and the image editing menu appears. Refer to *Table 17* for the function and description of each button on the screen.

Table 17. Edit Menu for Image Freeze

Item	Description
Select Scale Mode	Switches between automatic and manual temperature span.
ROI	Select the temperature measuring tool. Tap to enter the measuring tool sub-menu. For specific steps on how to use ROI, refer to *Temperature Measurement Region (ROI)*.
Text Annotation	Tap to open the sub-menu for text annotation. You can directly add and edit text information and automatically associate it with a thermal image. See *Text Annotation* for details.
Voice Annotation	Tap to open the sub-menu for voice annotation. You can directly record/play a voice annotation and automatically associate it with a thermal image. See *Voice Annotation* for details.
Tag	Enable/Disable the Tag function. You can enter tags manually or scan and read the information of a QR code/barcode and automatically associate it with a thermal image.

Add an Annotation

Use annotations to save additional annotation information along with a thermal image file. Annotation can provide important information about an image (for example, conditions and information about where the image was captured), making reporting and post-processing more efficient.

Annotation information is added to a thermal image file and can be viewed and edited both in the Gallery and on the PC based thermal image analysis software.

1. On the freeze screen interface, tap **Annotation** and input the text, voice, and tag information to be added.
2. Push **Save**, and the annotation information will be saved along with a thermal image file.

You can also add annotation to the saved thermal files in the Gallery.

This section describes the steps for adding voice/text/tag annotation to thermal image files on the screen freeze interface.

Note

You can add annotations to the saved thermal image files in the Gallery in a similar way.

Voice Annotation

You can add voice annotation to thermal image files. Add an annotation to a thermal image file by recording voice information through a connected Bluetooth headset or the Imager's microphone.

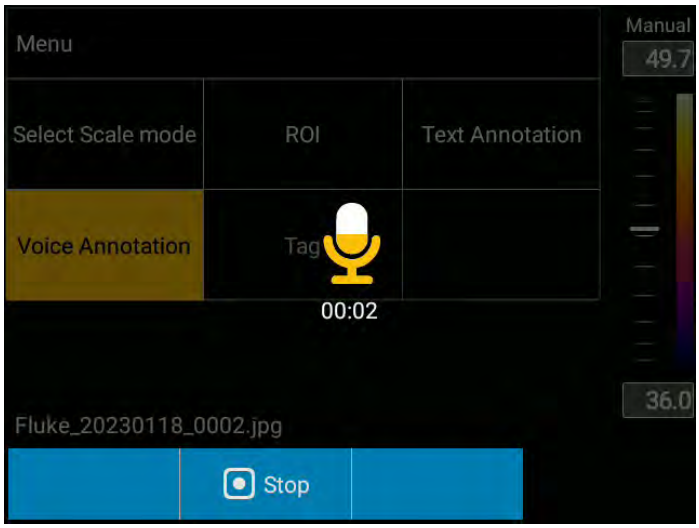


Figure 14. Add a Voice Annotation

To add a voice annotation:

1. In the screen freeze interface, push F2 (**Edit**) to enter the Edit menu.
2. Select Voice Annotation.
3. Push F2 (**Record**) to start recording.
4. After recording a voice, push F2 (**Stop**) to stop recording.
5. Push F1 (**Play**) to play the recorded voice.
6. Push F3 (**Close/Delete**) to delete the currently recorded voice and record again.
7. After recording, push F3 (**Close/Delete**) to close the voice annotation interface and save the voice to a thermal image file.

Text Annotation

You can add text annotations to thermal image files. With this function, you can add an annotation to a thermal image file by entering text information on the Imager's touchscreen.

To add a text annotation:

1. In the screen freeze interface, push F2 (**Edit**) to enter the Edit menu.
2. Select Text Annotation.
3. Tap the text box, a soft keyboard automatically pops up at the bottom of the touch screen, and an appropriate text input method will be applied.
4. After entering text, push F1 (**Save**) to save the text and return to the previous menu.

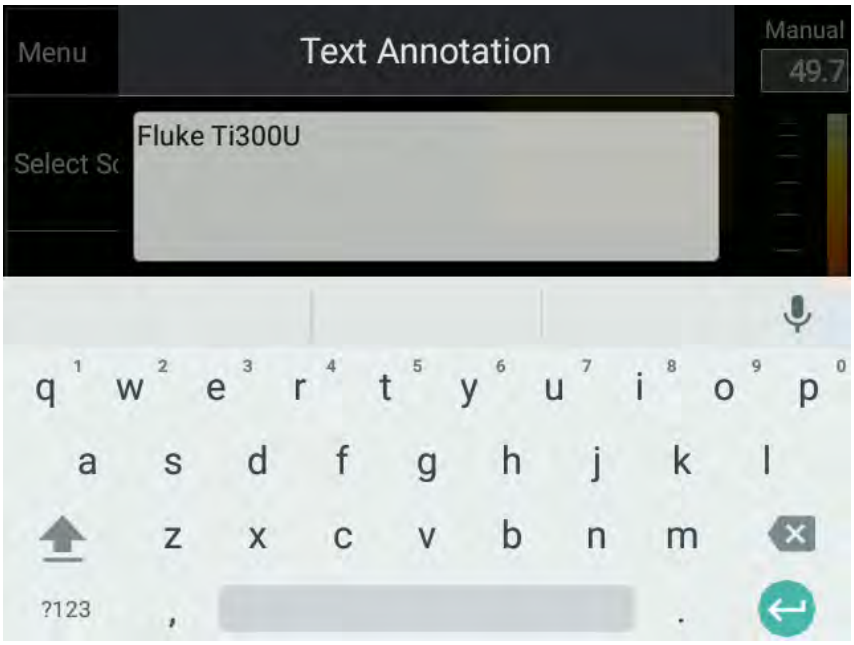


Figure 15. Add a Text Annotation

Tag

You can add a tag to a thermal image file. With this function, you can input a tag on the touch screen to add a tag to a thermal image file.

Figure 16. Add a Tag

To select a Tag:

1. In the screen freeze interface, push F2 (**Edit**) to enter the Edit menu.
2. Select **Tag**.
3. Tap the text box, a soft keyboard will automatically pop up at the bottom of the touch screen, and an appropriate text input method will be applied.
4. After entering a tag, push F1 (**Save**) to save the tag and return to the previous menu.

SmartView IR Software

The Fluke SmartView IR software can be used with the Imager and contains functions for analyzing images, organizing data and information and generating professional reports.

By using the SmartView IR software, you can:

- Stream fully-radiometric videos
- Create fully-radiometric videos or images
- Analyze images
- Plot data trends
- Export data
- Customize a report

Download and Install the SmartView IR Software

1. On the PC, go to: www.fluke.com/smartview-ir.
2. Download the SmartView IR software to the PC according to the instructions on the Product page.
3. On the PC, follow the instructions to install the SmartView IR software. (Administrator privileges are required for the installation.)

For details about how to remotely view and control the Product connected to the *SmartView IR* software, please refer to the instructions of the software.

View and Record Fully-Radiometric Streaming Video in Real Time

View and record fully-radiometric streaming video captured by the Imager in real time via the *Fluke SmartView IR* software for PC:

1. Use the Type-A USB cable provided with the Product, plug one end into the USB port on the right side of the Imager and the other end into a PC to connect the Imager to the PC, as shown in *Figure 17*.

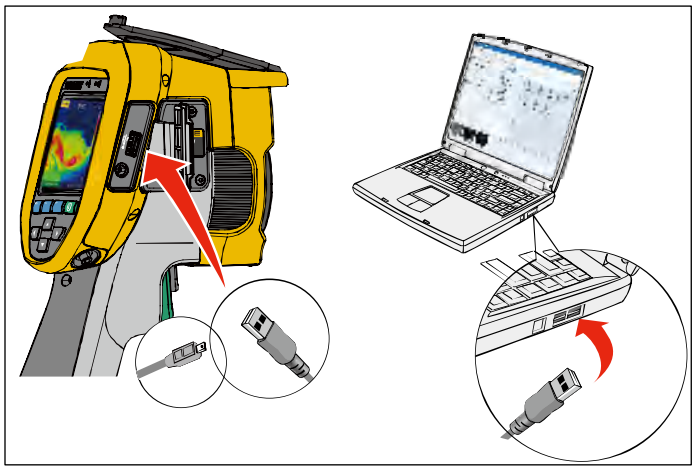
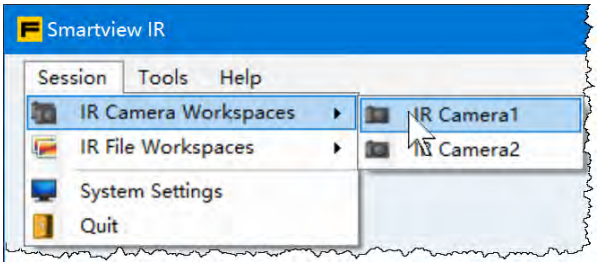
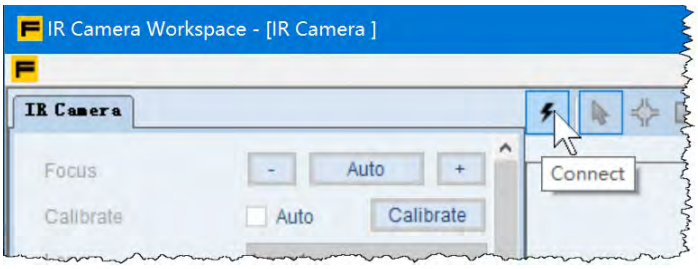


Figure 17. Live Streaming Video Connection

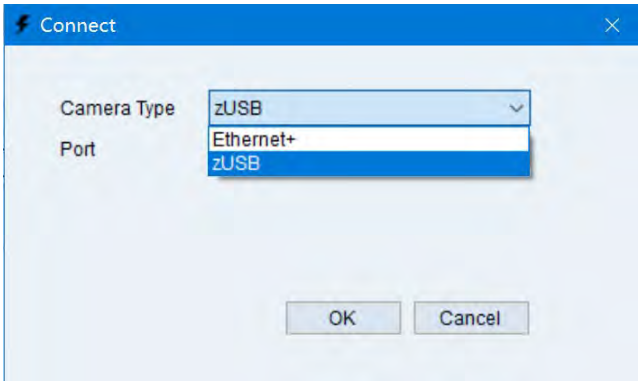
2. Run the *SmartView IR* software on a PC.
3. In the upper left corner of the main window of the SmartView IR software, click **IR Camera Workspaces**, and then select **IR Camera1** or **IR Camera2** from the pop-up menu, as shown below.



4. In the IR Camera window of the IR Camera Workspace interface, click (**Connect**) in the upper right corner.



5. In the Connect dialog box, set **Camera Type** to **zUSB**. Then click **OK**.



6. View and record fully-radiometric streaming video in real time by following the instructions in the *SmartView IR* software's user manual.

Import and Save Thermal Image Files

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

To use the removable memory card:

Remove the removable memory card from the Imager (see *Figure 4,* item ❸), and insert to a PC slot.

The location of the thermal image file on the SD memory card: `SD Card\Gallery`.

Note

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

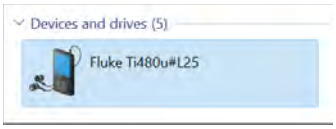
To import Thermal Image Files from the Imager directly:

1. Use the Type-A USB cable provided with the Product, plug one end into the USB port on the right side of the Imager and the other end into a PC to connect the Imager to the PC, as shown in *Figure 17*.

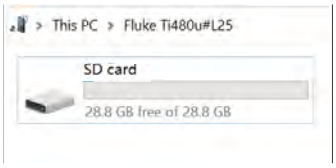
Note

The instructions for a PC can vary depending on different operating systems, but they are similar. Refer to the specific screen information for operation.

2. On your PC, open File Explorer and click to select **This PC** in the left column.
3. In the **Devices and Drives** on the right side of the File Explorer window, look for an icon of the multimedia device with the Imager's name below or next to it, for example "Fluke TX480u#L25", as shown below.



4. Double-click the icon of the Imager, to see 1 mobile storage device, such as **SD card**, which correspond respectively to the external memory card of the Imager, as shown below.



5. Copy thermal image files from the SD card or the Imager's internal flash memory to a folder on your PC as needed. You can create a target folder according to your standard practice.

   The location of thermal image files on the SD memory card (for example) This PC\Fluke Ti480u#L25\SD card \Gallery.

Optional Lenses

Table 18 is a list of optional Lenses for the Imager.

Table 18. Optional Lenses

Item	Description	Field of View
❶	Standard Lens	25° x 19°
❷	Wide-Angle Lens	44° x 34°
❸	2X Telephoto Lens	12° x 9°
❹	4X Telephoto Lens	7° x 5°

Replace Lenses

Additional IR inspection applications can be supported with optional telephoto and wide-angle lenses. For details on how to install or replace a lens, see *Figure 18*.

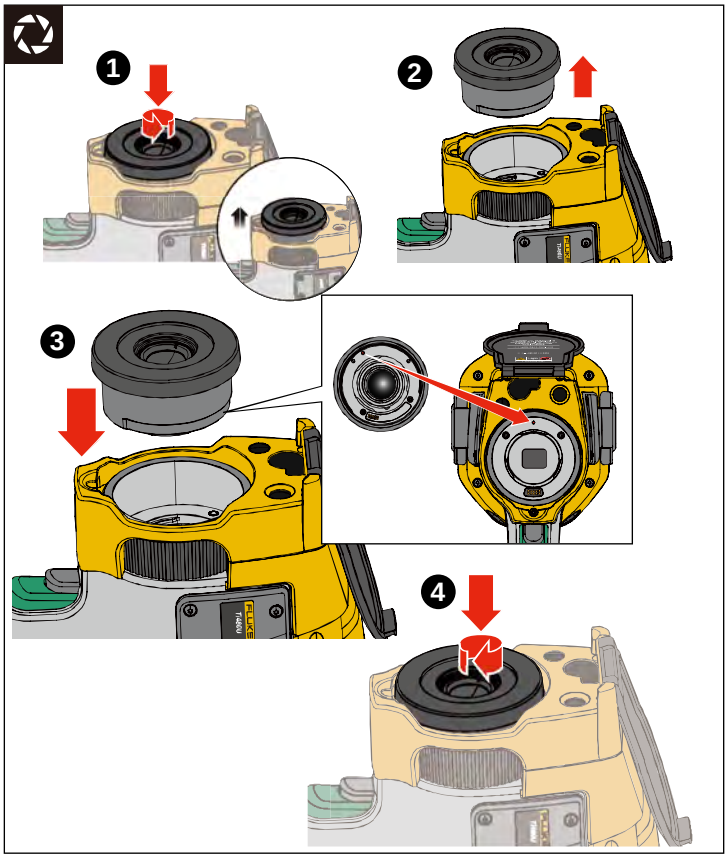


Figure 18. Replace a Lens

To replace optional lens:

1. Push and hold the buckle on the side of the Imager‘s lens cover.
2. Rotate the lens cover counterclockwise.
3. Pick up the optional lens to be installed, push down the buckle on the side of the lens, and align it with the lens mount of the Imager.
4. Rotate the optional lens clockwise; The optional lens is installed, when you hear a click.

Maintenance

There are no parts inside the Product requiring repair and maintenance and no special maintenance is needed. Only routine cleaning and lens care, battery replacement and battery charging are required.

⚠⚠ Warning

To prevent eye damage and personal injury, do not open the Product. The laser beam is dangerous to eyes.

Have the Product repaired only through an approved technical site.

Clean the Product

Clean the case with a damp cloth and a weak soap solution. Do not use abrasives, isopropyl alcohol, or solvents to clean the case or lens.

Lens Care

⚠ Caution

To prevent damage to the infrared lens:

- **Carefully clean the infrared lens. The lens has a delicate anti-reflective coating.**
- **Do not clean the lens too vigorously because this can damage the anti-reflective coating.**

To clean the lens:

1. Use a pressurized can of air or a dry nitrogen-ion gun, if available, to blow off the particulates from the lens surface.
2. Soak a lint-free cloth in a commercial lens cleaning liquid with neutral solvent.
3. Squeeze the cloth to remove excess liquid.
4. Wipe the lens surface in one circular motion and discard the cloth.
5. If needed, repeat with a new lint-free cloth.

Battery Care

⚠ Warning

To prevent personal injury and for safe operation of the Product:

- **Do not put battery cells and battery packs near heat or fire. Do not put in sunlight.**
- **Do not disassemble or crush battery cells and battery packs.**
- **Remove batteries to prevent battery leakage and damage to the Product if it is not used for an extended period.**

- **Connect the battery charger to the mains power outlet before the charger.**
- **Use only Fluke approved power adapters to charge the battery.**
- **Keep cells and battery packs clean and dry. Clean dirty connectors with a dry, clean cloth.**

⚠ Caution

To prevent damage, do not expose Product to heat sources or high-temperature environments such as an unattended vehicle in the sun.

To get the best performance from the lithium-ion battery:

- Do not store the Imager on the charger for more than 24 hours as reduced battery life may result.
- Charge the Imager for a two-hour minimum at six-month intervals for maximum battery life. Without use, the battery will self-discharge in approximately six months. Batteries stored for long periods will need two to ten charging cycles for full capacity.

Charge Batteries

Before you use the Imager for the first time, charge the battery for a minimum of two and one-half hours.

To charge the batteries:

1. Unlock the lock button of the battery compartment and remove from the camera.
2. Put one or two lithium batteries into bays of charger base.
3. Connect the power cable to the power socket on the back of the charger base.
4. Connect the power cable plug to an AC wall outlet.
5. When batteries are fully charged, remove the batteries, and disconnect the power supply. Put the charger back into the carrying case.

⚠ Warning

Wipe off any water or moisture from the batteries with a clean, dry cloth before inserting them into the Imager.

Note

Do not charge lithium batteries in an ambient temperature higher than 40 °C or lower than 0 °C. When you charge batteries in extreme temperatures, battery capacity may be decreased.

⚠ Caution

Do not incinerate the Product and/or the batteries.

Product Disposal

Dispose of the Product in a professional and environmentally appropriate manner:

- Delete personal data on the Product before disposal.
- Remove batteries that are not integrated into the electrical system before disposal and dispose of batteries separately.
- If this Product has an integral battery, put the entire Product in the electrical waste.

Radio Frequency Data

To view the Radio Frequency Data Class A Instruction Sheet, visit http://us.fluke.com/usen/support/manuals and search for “Radio Frequency Data Class A”.

Specifications

General Specifications

Model	Ti480U	Ti401U	Ti400U/Ti300U
Temperature			
Operating	-10 °C to 50 °C		
Storage	-20 °C to 50 °C without batteries		
Altitude			
Operating	2 000 m		
Storage	12 000 m		
Relative Humidity	0 % to 95 % (non-condensing)		
Power			
External Power	Power adapter (100 V to 240 V, 50/60 Hz AC power)		
Batteries			
Battery Type	7.2 V, 19 Whr rechargeable lithium battery		
Battery Life	2 to 3 hours for each battery pack (* Actual life depends on settings and usage)		
Battery Charge	Ti SBC3B Two Bay Battery Charger (100 V ac to 240 V ac, 50/60 Hz, included), or in-Imager charging. Optional 12 V automotive charging adapter.		
Charge Time	2.5 hours to full charge		
Power Save	Configurable auto screen-off		
Safety	IEC 61010-1: Pollution Degree 2		

Model	Ti480U	Ti401U	Ti400U/Ti300U
Electromagnetic Compatibility (EMC)			
International	IEC 61326-1: Industrial Electromagnetic Environment; CISP 11: Group 1, Class A		
Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.			
Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.			
Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.			
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment)		
Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.			
Wireless Radio	Frequency: 2400 MHz to 2483.5 MHz		
Laser	IEC 60825-1, Class 2; 650nm; <1mW		
Ingress Protection Rating	IEC 60529: IP52		
Size (H x W x L)	279 mm x 121 mm x 175 mm		
Weight	1215 g		1188 g

Detailed Specifications

Model	Ti480U	Ti401U	Ti400U
Temperature Measurements			
Total Range	-20 °C to 1200 °C	-20 °C to 650 °C	
Temperature Range			
Range 1	-20 °C to 120 °C	-20 °C to 120 °C	
Range 2	0 °C to 650 °C	0 °C to 650 °C	
Range 3	300 °C to 1200 °C	—	
Intelligent Range	√		
Accuracy	±2 °C or 2 %, whichever is greater, (at 15 °C to 35 °C ambient)		

Model	Ti480U	Ti401U	Ti400U
Imaging Performance			
IR Resolution	640 × 480		384 × 288
SuperResolution	1280 × 960	—	
Detector Type	Uncooled focal plane infrared detector		
Thermal Sensitivity (NETD), @ 30 °C	50 mk (0.050 °C)	75mk (0.075 °C)	
Infrared Spectral Band	7 μm to 14 μm		
Image Frame Rate	9 Hz/30 Hz		
Field of View (FOV)	25° x 19°		
Spatial Resolution (IFOV)	0.68 mrad		1.14 mrad
Minimum Imaging Distance	0.25 m		0.1 m
Focal Distance	f 24.8 mm		f 15 mm
Focus	Auto/Manual Focus		
Lens Recognition	Auto		
Digital Zoom	1X to 10X		1X to 4X
Measurement and Analysis			
ROIs	Point: 16; Line: 8; Area: 12		
Global Temperature Measurement Correction	Support correction for Emissivity, Ambient Temperature, Reflection Temperature, Humidity, Distance, IR Window (temperature and transmittance)		
Area Temperature Measurement Correction	Support Area Emissivity Correction		
ROIs and Audible Alarm	Support high and low temperature alarm for the maximum, minimum and average temperature of a ROI		
Temperature Rise (T-Rise)	The reference temperature can be the maximum, minimum, and average temperature of a ROI, or a custom temperature		
In-Imager Analysis	The thermal images or videos are analyzed directly in the Imager.		
Analysis software for PC	SmartView IR		
Image Display			
Display	3.5-inch LCD, 640 x 480		
Image Mode	Thermal, Digital Camera, PiP, T-DEF Fusion		
Palettes	Grey, Iron10, Iron, Rainbow, Grey10, GreyRed, MidGrey, Yellow and Rain Palettes can be inverted. Support real-time palette preview and switching		

Model	Ti480U	Ti401U	Ti400U
Temperature Scale Mode	Support automatic adjustment of temperature scale (min. 3 °C) Support manual adjustment of temperature scale (min. 2 °C) The maximum and minimum value of temperature scale can be selected by screen touch (min. 2 °C)		
Color and Audible Alarm	Yes. Above the temperature, below the temperature and between the temperatures		
Information displayed on the image	Display the global maximum, minimum, average temperature, and temperature measurement parameters		
high-low-temperature tracking	Marks and automatically tracks high and low temperature points		
IR-Fusion			
Blending degree of a visual photo and an infrared thermal image	0% to 100%		
Picture-in-Picture	Yes. You can adjust the size, position and blending degree of infrared window.		
Capture Function			
Digital Camera	Industrial grade digital camera with 13-megapixel lens		
Memory Card	Micro SD card, standard 32GB; expandable to 64GB, 128GB		
Capture Mode	Support single frame and time-lapse capture		
Image Format	.jpg		
Image freeze	Single-frame capture and fully-radiometric video recording	Single Frame	Single-frame capture and fully-radiometric video recording
Code Scanning Function	Yes. A QR code and barcode can be scanned as a tag		
Annotation Function	Support voice, text and tag annotation		
IR-PhotoNotes Annotation	5 images	2 images	
Fully-radiometric video recording	Support thermal video recording for analysis		Support thermal video recording for analysis
Non-radiometric video recording	Support thermal video, visible light video recording (only for viewing, not for analysis)		Support thermal video, visible light video recording (only for viewing, not for analysis)
Video Frame Rate	1 Hz to 9/16 Hz		1 Hz to 9/l16 Hz
Video Format	.is5 or .mp4		.is5 or .mp4
Gallery	Support viewing, editing and deleting captured thermal image and video files		

Model	Ti480U	Ti401U	Ti400U
Data Connections			
Bluetooth Connection	Support BT4.2 LE		
USB Connection	Type-A, USB 2.0		
HDMI Connection	Mini HDMI interface, HDMI 1.4		
Fully-Radiometric Streaming Video for PC	Fully-radiometric video analysis via PC software		
Remote display via software	Yes	—	—
Remote operation via software	Yes	—	Yes
HDMI output	Support connection to a display or a projector via the HDMI interface		
Ancillary functions			
Laser	Yes		
Temperature Feature Measurement	Support measuring the length of the temperature measurement line; support measuring the rectangular and circular area of the temperature measurement area		
LED Torch/Flashlight	Support LED torch and flashlight mode		