



# KSF-360 SF<sub>6</sub> Gas Leak Detection Thermal Imaging Camera

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## User Manual



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Version: A2  
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## To Customer

Dear Customers,

Thank you for choosing Gas Thermal Imaging Camera!

Please read this user manual carefully before first use. Also please keep in a safe place for reference in the future.

Please operate it according to the recommended instructions in user manual.

We reserve the right to change this user manual without further notice.



## WARNING

**DO NOT OPEN OR EXCHANGE PARTS!  
REPAIR ONLY CAN BE CONDUCTED BY STUFF!**

## CAUTIONS

- In order not to cause malfunction or even damage the device please do not direct the lens towards strong high-temperature radiation source (such as the sun) whether the power is on or off!
- Avoid violent shock and impact during operation or transport.
- Storage temperature is between  $-30^{\circ}\text{C}$  and  $60^{\circ}\text{C}$ . The device must be kept in original packing case during transport.
- Typical storage place is cool, dry, ventilated, and without strong electromagnetic field.
- Keep the lens surface off grease or any chemical substance which would damage the lens. Close the lid after operation.
- Please regularly backup data on PC to prevent potential data loss and format the internal FLASH memory duly to make it operate properly.

# Table of Contents

I . Overview .....	1
1. Standard Item List .....	2
II. Battery and Charger .....	3
1. Charging Battery .....	3
2. Direct Charging .....	4
3. Attention for Using Battery Charger .....	4
III. Panel Function Summary .....	5
1. Front View .....	5
2. Rear View .....	8
3. Right View .....	10
4. Bottom View .....	11
5. Left View .....	11
IV. Basic Operation .....	12
1. Battery Installation .....	12
2. Quick Operations .....	13
1) Obtain Image .....	13
2) Measure Target Temperature (not available in gas mode) .....	14
3) Store Images, Radiometric, Interval Photo, Audio Annotation and Video .....	15
4) Picture / Video View .....	17
5) Storage Information Export .....	19
6) Lens Replacement .....	19
V. Operation Guide .....	20

1. Thermal Image Interface Overview .....	20
2. Menu Function Description .....	23
1) Gallery .....	25
Photo .....	26
Video .....	27
2) Measure .....	28
Spot Measure .....	28
Spot measure parameter adjustment .....	29
Line Measure .....	30
Line measure operation introduction .....	30
Line measure parameter adjustment .....	31
Area Measure .....	32
Area measure operation Introduction .....	33
Area measure parameter adjustment .....	33
Circle Measure .....	34
Circle measure operation introduction .....	35
Circle measure parameter adjustment .....	35
3) Palette .....	36
4) Parameter .....	37
Temp Range .....	38
Lens Focal Length .....	38
Temp Unit .....	39
Isothermal Switch .....	39
Isothermal Color .....	40
Isothermal Range .....	41

Alarm .....	41
Alarm Color .....	42
Alarm Temp .....	43
Reference .....	44
Reference temperature difference alarm .....	44
Temperature measurement comparison setting .....	45
Emissivity .....	45
Window Transmission .....	46
Distance .....	47
Humidity .....	47
Ambient Temp .....	49
Adjust Temp .....	49
Reflection Temp .....	50
5) Storage .....	51
6) Mode .....	52
7) Zoom .....	54
8) Setting .....	55
Language .....	56
Auto zero time .....	56
Date & Time .....	56
Power Save .....	57
Power Off .....	57
Screen Brightness .....	58
OLED Brightness .....	58


Preset Text.....	58
Factory Settings.....	59
SD Card Format.....	59
WIFI.....	60
GPS.....	62
Bluetooth.....	62
OLED.....	62
Mode display.....	63
Palette display.....	63
High sensitivity mode.....	63
USB mode.....	63
Device and Disk Information.....	64
Image Overlay Information.....	64
Custom Short Press and Long Press.....	65
9) Laser Light.....	65
10) Fill Light.....	65
11) Zero Adjustment.....	65
VI. Gas Leakage Detection Mode.....	66
VII. Technical Specification.....	67
VIII. Simple Fault Diagnosis and Elimination.....	72
IX. Appendix: Emissivity of Raw Material.....	73

# Statement

## Quality Assurance

The quality management system for this product in R&D and manufacturing has been certified to ISO9001 standards.

## This Manual Agreement

 **WARNING:** Improper handling can result in severe damage to the camera.

Caution, attention, warning, danger: Remind items to be aware of during the operation.

Instructions, tips, tricks, thinking: Supplement and explanation of the operation content.

# **I . Overview**

The SF6 Gas Leak Detection Thermal Imaging Camera, equipped with cooled long-wave infrared detector, have the ability to scan large areas rapidly and pinpoint the gas leakage location accurately. Besides, it can monitor and inspect the devices that are difficult to reach with contact measurement tools. And then it produces the clear thermal image and accurate temperature reading of numerous objects to users. It is also packed with SD card to store thermal images and voice annotation, for the computer analysis.

## **Typical Applications:**

- ✓ Electric Power Industry: Detect and visualize the harmful gases leakages, such as SF6, and the thermal imaging status from the insulation electrical equipment, machines and high-voltage equipment switchgear. It is useful in fault diagnose.
- ✓ Petrochemical Industry: Check and detect oil pipelines, material interfaces, heat leakages, insulation structures and power equipment.
- ✓ Fire Protection: It is useful in forest fire protection, latent fire source searching, self-ignition prevention and detection of special material, and electric fire precaution.

- ✓ Medical Application: Measure and analyze human body temperature and field distribution of temperature.
- ✓ Building Industry: Detect humidity, air leakage and insulation.
- ✓ Other Applications: It is useful in research industry, development industry, automation industry, and so on.

## 1. Standard Item List

There are standard items and accessories.

Name	Quantity	Note
Thermal Imaging Camera	1	Standard
Li-Ion Battery	2	Standard
Charger	1	Standard
SD Card	2	Standard
USB Cable	1	Standard
SD Card Reader	1	Standard
User Manual	1	Standard
Warranty Card	1	Standard
U Disk	1	Standard
Transport Case	1	Standard

Adapter	1	Standard
Video Cable	1	Standard
Aviation plug power cable	1	Standard
Replace lens	1	Optional
Tripod	1	Standard

## II. Battery and Charger

It is recommended to charge battery immediately when device indicates low power. Please read more about battery installation and removal method.

It is strongly recommended to operate only with the included battery and charger. Use of any other brand charger or Li-Ion battery may cause fire or critical damage.

### 1. Charging Battery


- 1) Align the metal contact of the battery downward with the metal contact of the charger, gently flatten it and put it into the charger battery slot.
- 2) Connect the charger to an AC outlet, the indicator light on the left is red when charging, and turns green when fully charged; The right side is the

adapter insertion indicator, and the red light is always on after the adapter is connected to power supply.

- 3) Because it is an explosion-proof battery, it usually takes about 6 hours to fully charge an empty battery.

## **2. Direct Charging**

- 1) It is available to charge the built-in battery with the adapter; it is about 6 hours to fully charge a run-out battery, when charging directly, the red indicator light is always on, and the red light is off when fully charged.

: Please turn off the device when the ambient temperature is high, in order to avoid any danger.

## **3. Attention for Using Battery Charger**

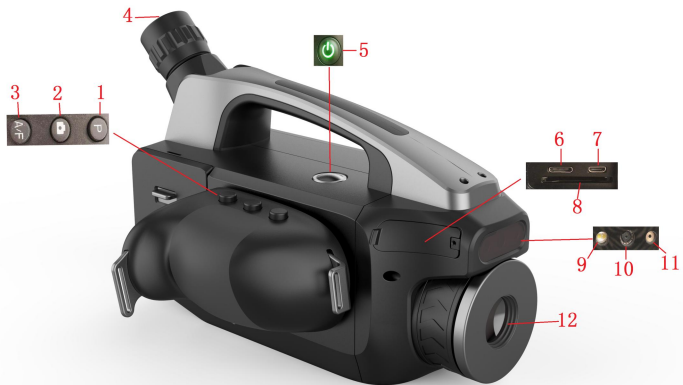
- 1) The battery can only be charged indoors, and cannot be charged in places where there is a risk of explosion or in an environment where it is exposed to sunlight or rain.

- 2) Do not short circuit the battery; do not carry the battery with conductive items such as keys and metal necklaces; Due to vibration during carrying, short circuit may be caused.
- 3) Do not put the battery in high temperature environment ( $\geq 60^{\circ}\text{C}$ ). Do not disassemble or dispose of in fire, which may cause explosion.
- 4) Do not try to modify the battery or the charger.
- 5) Li-Ion battery has no memory effect, charging can be conducted at any time.
- 6) Please remove the charger as soon as charging is completed.

### **III. Panel Function Summary**

In this manual, “long press” means pressing button down for about 2 seconds, and “press” or “short press” means pressing and release.

#### **1. Front View**



## 1) "P" custom function button

Some specific functions can be set to this button through the menu setting, and the two functions can be called by short press and long press, which is convenient for users to customize operations according to personal habits.

## 2) Photo/Video button

The photo and video button of the device. Select the required content, aim at the required content and take photo and record, long press is text & audio annotation (text and preset text).

### **3) Auto focus button**

The auto focus button of the device. When using, short press this button to auto focus. Long press this button to switch to current image display mode.

### **4) Tiltable Viewfinder**

Adjust the viewfinder to observe image clearly. It can reduce the effect of light and reflection.

### **5) Power ON/OFF Button**

The power ON/OFF button of the device. When turning on/off the machine, long press this button and hear a "beep" sound. When turning off the machine, long press this button, if need to shut down, click "OK", if not, click "Cancel". Long press the power button for more than 6 seconds to force shutdown.

### **6) USB interface**

Pictures, videos, test data and voice can be transferred to PC through the USB interface.

### **7) HDMI Output Interface**

Video output interface, use video cable to connect the device to monitor screen.

### **8) SD card slot**

SD card interface. Before using the instrument, please insert the SD card for saving file.

### **9) Light**

Use the illuminator button to turn the light on or off to shoot with the camera in a dark environment.

### **10) Camera**

5 megapixel integrated camera, auto-focus function. It can take photos under dim environment with LED light.

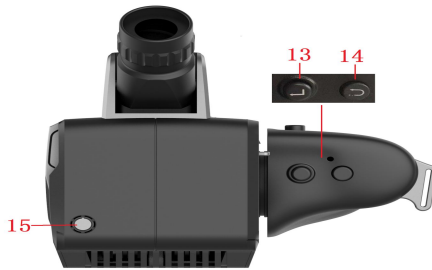
### **11) Laser Indicator**

Use laser indicator button to operate. **Please do not point it at human eyes.**

### **12) Lens**

The device configures standard lens. Users can choose other lens according to needs.

## **2. Rear View**



### 13) Direction Buttons

Direction buttons include Up (▲), Down (▼), Left (◀), Right (▶) and ◀ (Menu / Confirm) button.

**Menu Mode:** Short press ◀ to enter the menu, short press ▲, ▼, ◀, ▶ to select the menu items.

◀ (Menu/Confirm) button: Confirm button, enter the menu option button.

◀ (Left) button: Freeze/thaw image.

▶(Right) button: Enter the menu, right select.

▲(Up) Button: Enter menu, up select.

▼(Down) Button: Enter menu, down select.

***Note: The following key operations are indicated by the up, down, left, right and confirm buttons.***

#### **14) Return Button**

The return button of the device. When entering the next menu, click this button to return to the previous menu.

#### **15) External Power Connector**

The external power connector of the device. The device can be charged directly. When charging, please use the original adapter of the device for charging.

### **3. Right View**



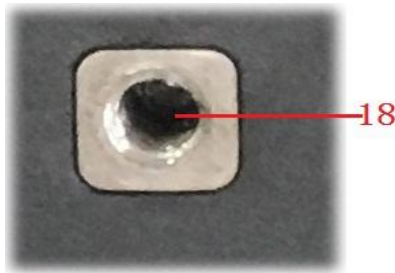
#### **16) Battery Snap-fit Button**

When installing or removing the battery, press the Snap-fit button gently so the battery will pop-up automatically.

#### 17) Battery

It is the device original rechargeable Li-ion battery, when fully charged under normal temperature, it can work for >3 hours continuously, users can choose original smart charger or power adapter for charging.

#### 4. Bottom View



#### 18) Screw Nut on Tripod

Size of screw nut on tripod is 1/4"

#### 5. Left View



### **19) LCD Screen**

HD 5" Color 270° rotatable LCD with 1280\*720 pixels.

## **IV. Basic Operation**

### **1. Battery Installation**

Push the lithium battery into the battery box according to the fixed direction, then close the rear cover (to open or close the cover, please press the back cover button with your finger as shown in the figure below)



Rear cover view

## 2. Quick Operations

When you turn on the camera, the cooling procedure will typically take 5-7 minutes. During this procedure, the screen only shows the visible image and the system info, and the function buttons are unavailable. When this procedure is done, the camera will switch to gas detection mode automatically, and the function buttons are available.

### 1) Obtain Image

- ① Insert the battery correctly.
- ② Long press power button until the start-up sound rings. The company LOGO first appears on the screen, followed by the word "Loading". After the progress bar is loaded, the device will enter the working state.

③Open the lens cover, aim at the target, short press the auto focus button to obtain a clear target thermal image.

④Long press the zeroing button, the device will make two slight “clicks” sound and then complete the zero adjustment, and the best thermal image will appear.

⑤If users need to take a gas or visible image, users can change in mode.

## **2) Measure Target Temperature (not available in gas mode)**



①Adjust the position of the device to move the image of the object to the screen cross temperature point.

The “+\* = x x” (\* indicates temperature measurement point 1, ....10 number value) displayed in the upper right corner of the screen is the temperature of the target at the temperature measurement point.

In order to ensure accurate measurement, please long press the zeroing button first and then measure.

②When the target object is too small or the highest temperature cannot be judged, the area measure can

be used.(For detailed operation, see **Measure - Area Measure**)


③To measure multiple targets on the screen or use a variety of methods for temperature analysis, short press  button to freeze image, then use multi-point temperature measurement, area measure or line measure to analyze. To return to the real-time temperature measurement interface, short press  again.


④In the standard range (-40~+50°C), if the target temperature is higher or lower than the upper or lower limit temperature corresponding to the temperature measurement range of the equipment.


### **3) Store Images, Radiometric, Interval Photo, Audio Annotation and Video**

①To get the desired image, short press the camera button, if the sign "Picture Name Appears" appears in the upper left corner of the screen, the emissivity, distance, ambient temperature and humidity appear at the bottom of the screen, the photo is taken. Long

press the camera button, when the "**Audio & Text Annotation**" dialog box appears, select "Save" directly, then only save the image file; Click the icon "■" to start and end recording operations, single image voice recording time is up to 60 seconds.


② Short press  button to enter menu, or finger tap **Save**→**Video**. Short press camera button, if "Recording and Time" appears on the upper left corner of the screen, it means Recording. If you want to end the recording, press the camera button again and a "Recording Name" will appear on the upper left corner of the screen, and the system will automatically store the video you took.


③ Short press  button to enter menu, or finger tap **Save**→**Interval Photo**. Select the interval time for automatic capture according to user needs. The time can be selected from 5 seconds, 10 seconds, 20 seconds, and 30 seconds. The time can be selected from 1 minute, 3 minutes, 5 minutes, 10 minutes, 15 minutes, 30 minutes, and 60 minutes.


④ Short press  button to enter menu, or finger tap **Save**→**Radiometric**. Short press camera button, if "Recording and Time" appears in the upper left corner of the screen with small red dot flashing, it means radiometric recording. If you want to finish the recording, press the camera button again and a "Recording Name" will appear in the upper left corner, and the system will automatically store the radiometric video you took.




**Note:** The radiometric video needs to be opened and viewed in the PC software designated by the device. It cannot be viewed on the device.

#### 4) Picture / Video View

① Short press button  to enter menu, or finger tap the photo in the file to view it. Users can also short press button 2 on the device to view.

② Select **Gallery**→**Photo**, DCIM folder will appear, click the folder to enter the image thumbnail interface. Now short press any five-way button to select the picture. Short press the button  again, open the picture and

enter the preview state. (When touching the screen, just click the desired picture to enter the preview state.)To delete a picture, short press any button of five-way button to select "Select" in the upper right corner, short press  button enter picture selection interface, select the picture and press any button of five-way button to select the word "Delete" directly below to delete.(When touching the screen, tap to open the picture, and long press to select the picture to delete.)If the operation is abandoned, return key (or touch screen return).

③When previewing a picture, press  or  to select the previous or next page, short press  again to switch pictures (or finger tap the picture).





④Pictures with a " " mark indicate that a voice annotation is stored, short press the button  (or tap the screen with finger) to enter the picture, finger tap the right  button to play the recording operation.

Image with a " " mark to indicate that a text annotation is stored, finger tap "Text Display" on the right side of the screen to display the preset text.

⑤In the preview state, short press the return button to return to the live image status.(In the touch screen mode, finger click to return, exit the preview and then right slides to come back to the previous menu.)

⑥Select **Gallery**→**Video**, enter the video preview interface, click to select the video to play. In the video preview interface, click the select button in the upper right corner to select the corresponding video, and then click the delete button to delete it. If the operation is abandoned, click Cancel.

## **5) Storage Information Export**

Use the USB cable to connect the device to the computer, and use the computer to operate the stored content on the SD card, including image export, deletion, formatting, and so on.

## **6) Lens Replacement**

①Please power off the device before lens replacement.

②The device can be equipped with various lenses. Press the spring mandrel to turn lens in clockwise direction to remove it as Figure 1 below.

③Align the anchor point with mandrel to install the lens as Figure 2 below. And then turn lens in anticlockwise direction to finish the installation.

④In **Measure**→**Lens Focal Length** menu, press **<or>** button to change the corresponding lens.



Figure 1

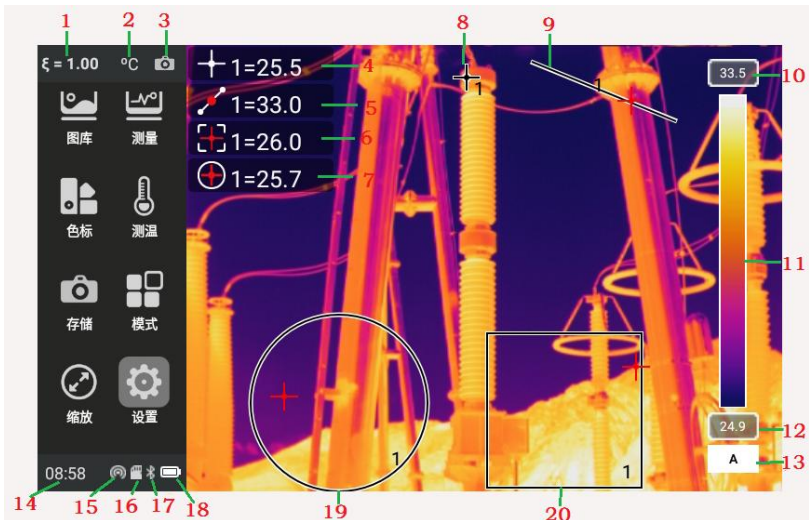


Figure 2

## V. Operation Guide

### 1. Thermal Image Interface Overview

The interface is shown below.



Thermal Image Interface

- 1) Emissivity: The emissivity of the current temp measure setting.
- 2) Temperature unit: The current temperature unit, there are three units of °C, °F, K to choose from; this function can be changed in **Measure**→**Temperature Unit**.
- 3) Storage Mode: The currently storage mode. Image, record, Radiometric; this function can be changed in **Storage**.
- 4) Spot measure: It indicates the measurement temp of spot 1. (10 spots can be selected)

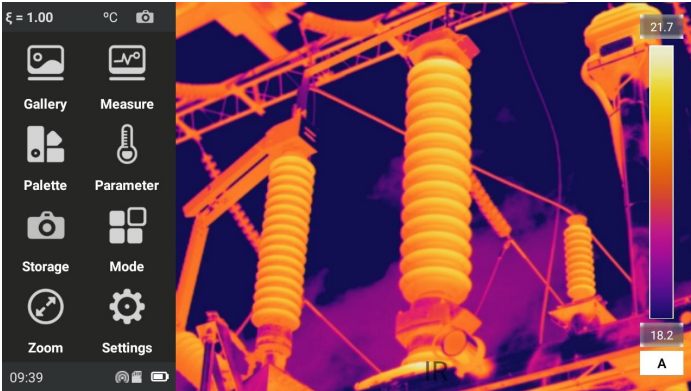
- 5) Line measure: It indicates the temp measurement result of line 1 (5 lines can be selected, the highest temp, the lowest temp and the average temp can be selected).
- 6) Area measure: It indicates the temp measurement result in area 1 (5 areas can be selected, the highest temp, the lowest temp and the average temp can be selected).
- 7) Circle measure: It means the temp measurement result in circle 1 (3 circles can be selected, the highest temp, the lowest temp and the average temp can be selected).
- 8) Spot measure cursor: Through the touch screen operation, the position can be arbitrarily selected. This function is turned on in the **Parameter** → **Spot measure**.
- 9) Line section measure line: Through the touch screen operation, the position can be arbitrarily selected. This function is turned on in **Parameter** → **Line measure**.
- 10) &12) Upper and lower limit temp: Upper and lower limit temp values of the palette.
- 11) Palette: Color bar. Users can freely choose the corresponding palette, but only change the image's viewing effect, it does not affect the parameter. There are 12 common palettes to choose from.

- 13) Image mode: A can switch the color bar to auto mode.
- 14) Time display: Displays the time set by the system. This function is modified in **Setting** → **System Time**.
- 15) wifi flag: This function is opened in **Setting** → **wifi**.
- 16) Storage medium mark: Displays whether the SD card is inserted (images, videos and Radiometric can only be stored on the SD card).
- 17) Bluetooth mark: This function is turned on in **Setting** → **Bluetooth**.
- 18) Battery Status: Displays the current battery level.
- 19) Circle measure: Operate through touch screen. This function is turned on in the **Parameter**→**Circle Measure**.
- 20) Area measure: Operate through touch screen. This function is turned on in the **Parameter**→**Area measure**.

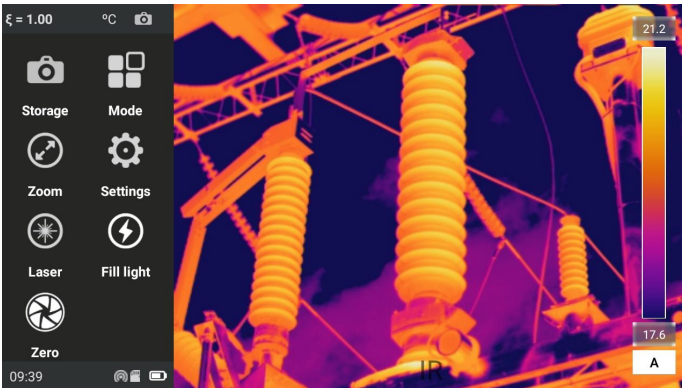
## 2. Menu Function Description

The menu mainly includes **gallery, measure, palette, parameter, storage, mode, zoom, settings, laser light, fill light, and zero.**

**Menu structure:**



Main Interface



Main Interface

***Button mode:***

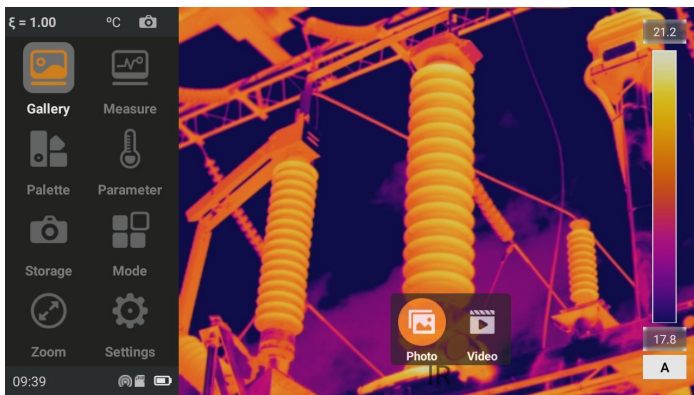
Short press the confirm key to enter the menu interface, the selected menu will be highlighted with a gray background. Short press the enter key again, it will be highlight with orange and enter the next level menu, the

next level of operation is consistent. Up, down, left, right click to select the desired function, short press the enter key again to confirm the selection function. Short press the return button to return to the previous operation.

***Touch mode:*** In the main interface, the function icon clicked by the finger will highlight in orange, enter the next level menu, and click the blank space again to exit the menu.

## 1) Gallery








The saved photos and videos can be previewed under the Gallery menu.








Gallery

## Photo

Under the photo menu, users can preview, text display, record play and edit of the saved image files.

**Button mode:** After entering the menu, select "Gallery" in the menu, short press  button to select photo to enter the photo folder, short press  button again to enter the picture thumbnail interface. Short press , , ,  button to select needed photo, after selecting a picture file, short press  button to select open, long press to select delete. Short press the return button to exit the menu.

After entering the photo management menu, the photo will be displayed in the format " P\_YYYYMMDD\_00001-IR", "P\_YYYYMMDD\_00001-DC", "P\_YYYYMMDD\_00001" is image name. P is photo, YYYYMMDD is date, 00001 is the first image in this mode (push in sequence); IR means the picture of infrared mode and gas mode. DC means a picture in visible light mode. A picture with a  " symbol indicates a voice annotation, a  " symbol indicates a text annotation. When previewing, users can short press ,  to select the

previous or next page, and short press  to enter the next or previous page.

Enter the picture for recording playback, text display, and editing operations. Touch the screen, when users choose "Text Display", text is displayed on the left side of the image, when choose "Play Recording", stored voice file will play;

When users choose "Edit", image temp measurement analysis can also be performed in the image preview state. Press the direction buttons to select the menu that needs to be operated (or finger tap edit to enter). **The picture mentioned above must be an unhandled picture taken by the device.**

**Touch mode:** After tapping the file, tap the photo again to enter the image preview, preview the interface, tap to view the image.

## **Video**

Under the video management menu, you can preview and delete saved video files.

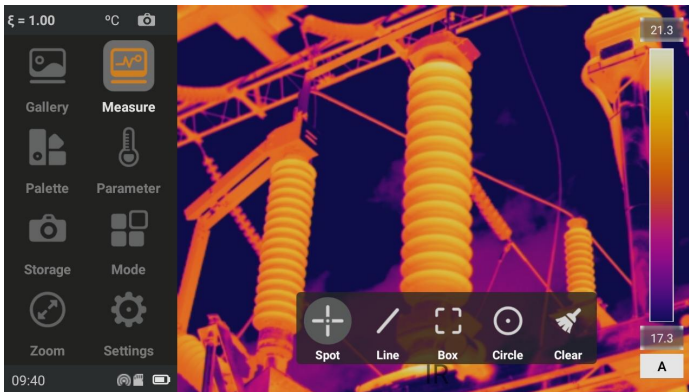
**Button mode:** Short press ,  button to fast forward or rewind, short press  button to pause or play. The exit

menu mode is the same as the key operation of picture management.

**Touch mode:** After clicking the file, the video will be played directly.

## 2) Measure

Under the measure menu, there are a few options: **spot, line, area, circle and clear.** (*Note: This function is not available in gas mode*)



Measure menu interface

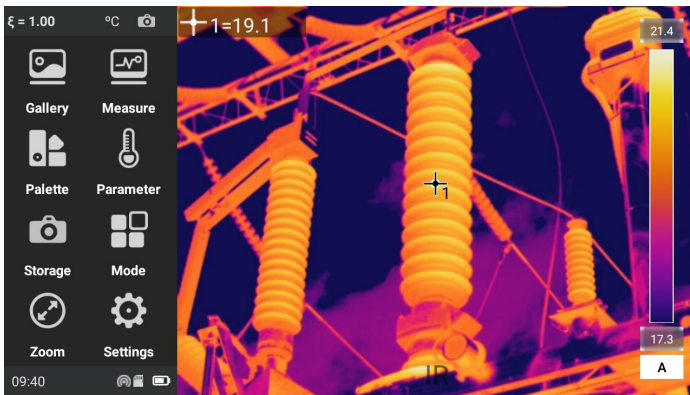
### Spot Measure

**Button mode:** The temp measurement target dialog box appears after entering this menu. Short press **<**, **>** to select target, short press the enter key to call out the temp

measurement spot, up to 10 spots can be selected at the same time.

**Touch mode:** Lightly tap spot measure. Long press the temp measure cross cursor to call out the temp measurement parameters and modify them, emissivity, deletion.

### Spot measure operation introduction



Spot measure only measures the temp of a single spot on the image, labeled  $\text{---}1$ , the number indicates the temp target spot code. At the same time, the upper left of the LCD screen will show " $\text{---}1 = x x$ ", " $x x$ " means the temp of this spot, up to 10 spots can be selected at the same time.

### Spot measure parameter adjustment

***Touch mode:*** Long press the temp measurement mark to call out the parameter interface, temp measurement type, emissivity, deletion. Long press the cursor to drag to freely select the position.

**Temp measurement type:** No temp measurement type.

**Delete:** Spot measure cursor deletion.

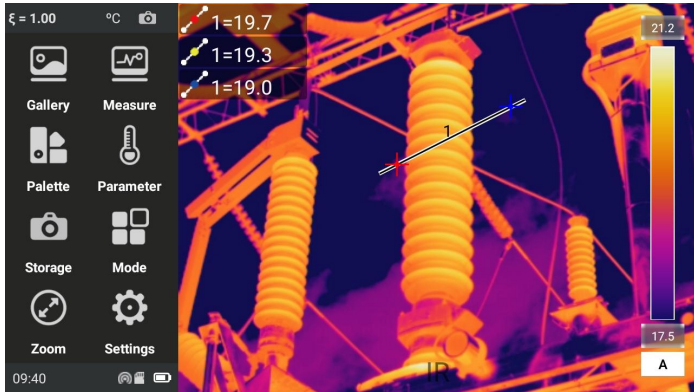
**Emissivity:** See *Emissivity Rate of Common Materials* for details.

## **Line Measure**

***Button mode:*** The temp measurement target dialog box appears after entering this menu. Short press <,> to select target, short press the enter key to call out the line measure, up to 5 lines measure can be selected at the same time.

***Touch mode:*** Lightly tap line measure. Long press line measure cursor can call out the temp measurement parameters and modify, temp measurement type, emissivity, deletion.

## **Line measure operation introduction**



Line measure interface

Line measure is the temp sampling line, labeled “/1” . At the same time, a cursor line appears on the LCD, the upper left of the LCD will display” /1= XX” , “x x” can represent the average temp, the highest temp and the lowest temp of the cursor line.

### **Line measure parameter adjustment**

***Touch mode:*** Long press the line cursor temp marker to call out the temp measurement parameter interface, temp measurement type, emissivity, deletion. Long press and drag the cursor to freely select the position and length.

**Temp measurement type:** The highest temp, average temp, lowest temp are optional, select according to needs (default highest temp).

Highest temp: The device automatically searches for the highest temp point on the line and displays;

Lowest temp: The device automatically searches for the lowest temp point on the line and displays;

Average temp: The device automatically measures and calculates the average temp on the entire line. At this time, the cross cursor does not appear on the line;

**Delete:** Line measure cursor deletion.

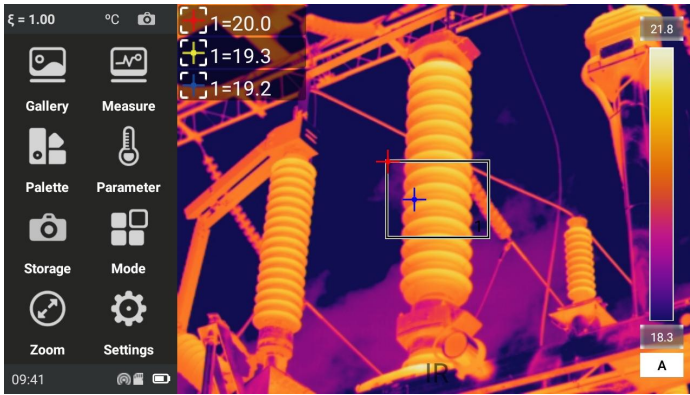
**Emissivity:** See *Emissivity Rate of Common Materials* for details.

## **Area Measure**

**Button mode:** The temp measurement target dialog box appears after entering this menu. Short press **◀**, **▶** to select target, short press the enter key to call out the area measure, up to 5 areas can be selected at the same time.

**Touch mode:** Lightly tap area measure. Long press the area in measure to call out the area measure parameters and modify, temp measurement type, emissivity, deletion.

### Area measure operation Introduction



When the device performs area measure, a temp value is displayed in the upper left corner of the screen, and it is the sampling point temp of the corresponding area. There are three types to choose: highest temp, average temp, and lowest temp. The operation method is described below.

### Area measure parameter adjustment

**Touch mode:** Long press the area cursor temp marker to call out the temp measurement parameter interface, temp measurement type, emissivity,

deletion. Long press the rectangle to drag to select the position and size.

**Temp measurement type:** The highest temp, average temp, lowest temp are optional, select according to needs (default highest temp).

Highest temp: The device automatically searches for the highest temp point in the area and displays;

Lowest temp: The device automatically searches for the lowest temp point in the area and displays;

Average temp: The device automatically measures and calculates the average temp in the entire area. At this time, the cross cursor does not appear in the area;

**Delete:** Area measure cursor deletion.

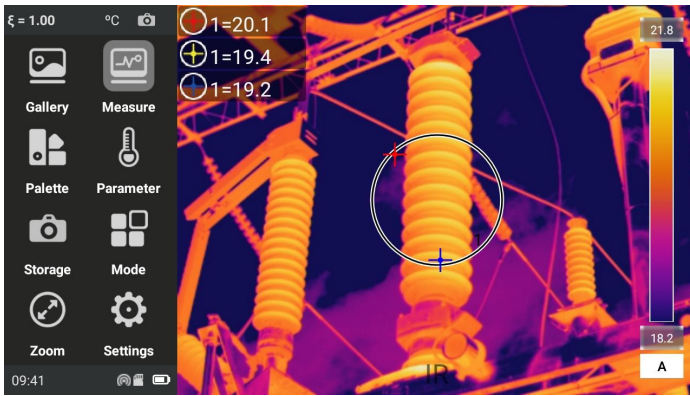
**Emissivity:** See *Emissivity Rate of Common Materials* for details.

## **Circle Measure**

**Button mode:** The temp measurement target dialog box appears after entering this menu. Short press <, > to select target, short press the enter key to call out the circle measure. Up to 3 circle measure can be selected at the same time.

**Touch mode:** Lightly tap circle measure. Long press the area in circle measure to call out spot measure parameters and modify, temp measurement type, emissivity, deletion.

### Circle measure operation introduction



When the device performs circle measure, a temperature value will be displayed in the upper left corner of the screen, which is the temperature of the sampling point in the corresponding circle. There are three types to choose: highest temp, average temp, and lowest temp. The operation method is described below.

### Circle measure parameter adjustment

**Touch mode:** Long press the circle cursor measure marker to call out the temp measurement

parameter interface, temp measurement type, emissivity, deletion. Long press the cursor to drag to freely select the position and size.

**Temp measurement type:** The highest temp, average temp, lowest temp are optional, select according to needs (default highest temp).

Highest temp: The device automatically searches for the highest temp point in the circle and displays;

Lowest temp: The device automatically searches for the lowest temp point in the circle and displays;

Average temp: The device automatically measures and calculates the average temp in the entire circle. At this time, the cross cursor does not appear in the area;

**Delete:** The circle measure cursor is deleted.

**Emissivity:** See *Emissivity Rate of Common Materials* for details.

### 3) Palette

The palette menu allows freely selection of the color of the thermal image. There are 12 options available for selection, and inversion indicates the color inversion for the upper and lower limits of the palette.

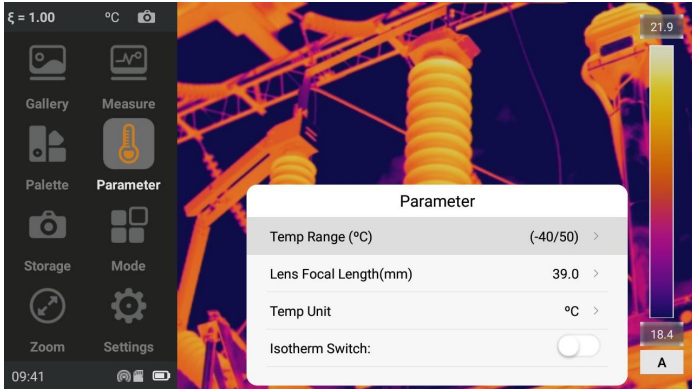


**Button mode:** Click **>** to enter the main menu, and click **^** and **v** to select a submenu or option. The selected option will be highlighted on a white background, and then click **←** to enter the menu; Click return button to return to the previous menu or exit.

#### 4) Parameter

There are 19 options under the menu: **Temp measure range, lens focal length, temp unit, isothermal switch, isothermal color, isothermal range, alarm, alarm color, alarm temp, reference, reference temperature difference alarm, temperature measurement comparison alarm, emissivity, window transmission,**

**distance, humidity, ambient temp, adjust temp, reflected temp.**



## **Temp Range**

The temp measurement interval is selected by the user according to specific conditions. This device has a wide temp range, when it is 14°/24°, the temp range includes low temp (-40/50°C), medium temp (0/150°C) and high temp(120/350°C).

**Note: It is recommended to use manual focusing in high temperature gears**

## **Lens Focal Length**

According to the device, thermal camera is equipped with 14°/24° lens. According to the different lenses

selected for the device, this item must be set to the corresponding lens, otherwise it will affect the accuracy.

⚠ After switching the lens, users need to wait for the lens to balance adjustment for a certain time and then measure the temp.

### **Temp Unit**

Choose appropriate temp unit: Celsius temp °C, Fahrenheit temp °F, Kelvin temp K. Conversion of the temps:  $^{\circ}\text{F}=1.8^{\circ}\text{C}+32$ ,  $\text{K}=273.15+^{\circ}\text{C}$




### **Operation mode of the above menu:**

**Button mode:** Short press <or> button to choose the menu to be modified. Short press ↵ button to confirm to enter the menu and select according to needs. Short press ↵ button to confirm save. Short press the return button to exit the current menu.

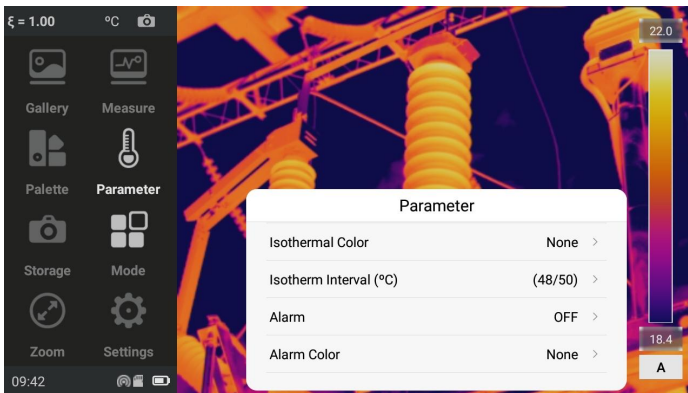
**Touch mode:** Lightly tap the menu to be modified, to enter the menu and select according to needs. Lightly tap the conformation icon. Lightly tap the temp measurement icon to exit the current menu.

### **Isothermal Switch**

Images in a certain temp range are displayed in yellow for the purpose of highlighting. If the isothermal switch is turned on, the device will display an isothermal color. The default is off.

**Button mode:** Short press ,  button to select the parameters to be adjusted. Short press  button to turn on switch, short press the return button to exit the current menu.

**Touch mode:** Lightly tap the menu to bring up the dialog box, lightly tap the isothermal switch to open, lightly tap the image icon to exit the current menu.



## Isothermal Color

Turn on the isothermal switch, set the temperature of the isothermal range, and the picture temperature taken




by the device will display the isothermal color within the isothermal range. The isothermal color can be red, green, black, gray, yellow, purple, and orange. If isothermal color is not required, select None.


### **Isothermal Range**

Set the size of the isothermal area in the "Isothermal Range" function, expressed by width of the temp interval. The temperature objects within this range are yellow.

### **Alarm**

When in the thermal image range, whether the temp alarm function is enabled. If this function is enabled, an audible alarm will be applied when the temp value exceeds or falls below the set alarm temp.







**Button mode:** Short press ,  button to select the parameters to be adjusted. Short press  button to enter the alarm column. Enter the menu to turn off the alarm and set the high or low temp alarm for the set temp. Short

press  button to save changes. Short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the menu to bring up the dialog box, lightly tap the alarm column, enter the menu and slide up and down to set the high temp or low temp alarm for the set temp. Tap the Confirm button, tap the image icon to exit the current menu.

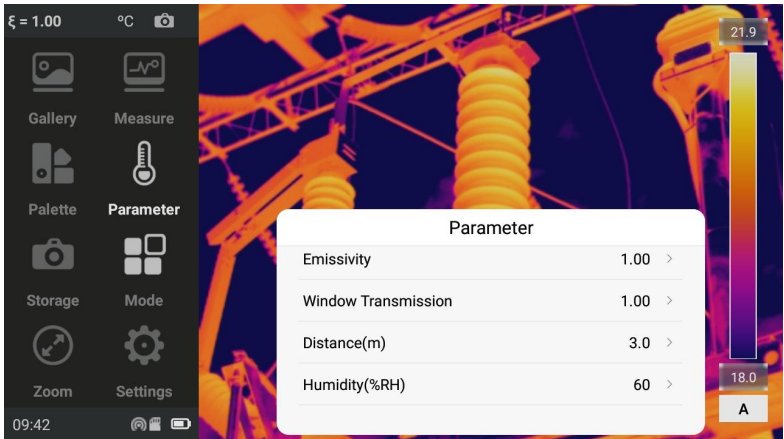
### **Alarm Color**

Set the required alarm temperature and color, and the content photographed will show the color of the selected alarm when in the alarm temperature. There are 9 kinds of alarm colors to choose, if don' t need, select "None".

***Button mode:*** Short press ,  button to select the parameters to be adjusted. Short press  button to enter the alarm color column. Enter the menu and short press ,  button to modify alarm temp. Short press  button to save changes. Short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the menu to bring up the dialog box, lightly tap the alarm color column, enter the menu and slide up and down to set the alarm color. Tap


the Confirm button, tap the image icon to exit the current menu.



## Alarm Temp

Set the temp value of the alarm. When the alarm is turned on, setting the alarm temp can generate an alarm when the current temp exceeds or falls below the set temp value.


**Button mode:** Short press  $\wedge$ ,  $\vee$  button to select the parameters to be adjusted. Short press  $\leftarrow$  button to enter alarm temp column. Enter the menu and short press  $\wedge$ ,  $\vee$  button to modify alarm temp. Short

press  button to save changes. Short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the menu to bring up the dialog box, lightly tap the alarm temp column, enter the menu and slide up and down to set the alarm temp. Tap the Confirm button, tap the image icon to exit the current menu.

### **Reference**

Select whether to turn on the reference temp measurement. If OFF is selected, display actual temperature; If ON is selected, display relative temp.

***Button mode:*** Short press  button to choose whether to turn on reference temp measurement. Enter the menu to set reference temp. You can set the temp measurement object for reference.

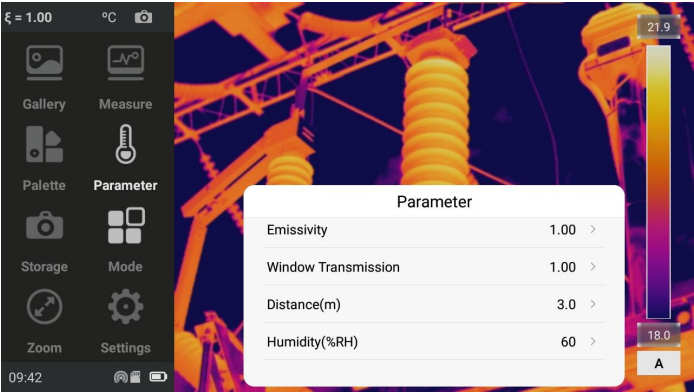
***Touch mode:*** Lightly tap the option to choose whether to enable. Enter the menu to set the reference temp, you can set the temp measurement object for reference.

### **Reference temperature difference alarm**

Turn on the reference temperature difference alarm to set the reference alarm temperature. When the difference between the temperature on the screen and the set temperature exceeds the alarm value, the device will give an alarm.

### Temperature measurement comparison setting



The pictures of two temperature measurement types can be compared.



### Emissivity

Emissivity varies with different target surface temp, surface shape, condition, measured angle, etc. The emissivity provided in the appendix is for reference only. In practical applications, it is also necessary to set the emissivity according to the oxidation or other conditions of the surface of the object.




**Button mode:** Short press  button to enter menu.

The emissivity changes 0.01 for one time. Short press  or  button, the emissivity changes. This setting value is valid only for the currently activated temp measurement function items (spot measure, line measure, area measure).

**Touch mode:** Lightly tap the menu to bring up the dialog box, tap the emissivity column, enter the menu to slide up and down to set. Tap the Confirm button, tap the image icon to exit the current menu.

### **Window Transmission**

The window transmission can be selected according to needs, and the transmission can be selected from 0.01-1.00.





**Button mode:** Short press  button to enter menu, the transmission changes 0.01 for one time, short press  or  button, the transmission changes.

**Touch mode:** Lightly tap the menu to bring up the dialog box. Lightly tap the window transmittance column, enter the menu to slide up and down to set. Tap the

Confirm button, tap the image icon to exit the current menu.

### **Distance**

Set the distance of the environment in which the device is used to make temp measurement more accurate. If the target is relatively close (low temp is less than 8 meters, medium temp is less than 4 meters), the distance has little effect on temp measurement and can be ignored.

**Button mode:** Short press  button to enter menu. The adjustment range is 0.5 at a time within 0~30 meters, 1 at a time within 30~100 meters, and the longest distance is 100 meters. Short press  or  button, the distance changes, short press  button to confirm. Short press the return button to exit the current menu.




**Touch mode:** Lightly tap the menu to bring up the dialog box. Lightly tap the distance column, enter the menu to slide up and down to set. Tap the Confirm button, tap the image icon to exit the current menu.

### **Humidity**

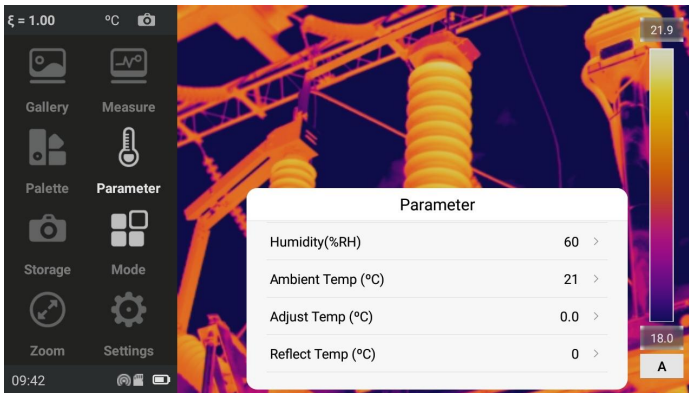
Set the relative humidity of the environment in which the device is used to make temp measurement more

accurate. If the target is relatively close (e.g., less than 10 meters), the relative humidity has little effect on the temp measurement and can be ignored.

**Button mode:** Short press  button to enter menu.





The humidity changes 1% for one time. Short press  or  button, the humidity changes. Short press  button to confirm. Short press the return button to exit the current menu.

**Touch mode:** Lightly tap the menu to bring up the dialog box. Lightly tap the humidity column, enter the menu to slide up and down to set. Tap the Confirm button, tap the image icon to exit the current menu.



## Ambient Temp


Record the ambient temp when shooting infrared images. To use this function, users need to manually enter the current ambient temp before shooting. After shooting, the user can view the ambient temp of the infrared image in the PC software.




**Button mode:** Short press  button to enter menu. The ambient temp changes 1°C for one time. Short press  or  button, the ambient temp changes. Short press  button to confirm. Short press the return button to exit the current menu.

**Touch mode:** Lightly tap the menu to bring up the dialog box. Lightly tap the ambient temp column, enter the menu to slide up and down to set. Tap the Confirm button, tap the image icon to exit the current menu.

## Adjust Temp

In some special cases, the temp measurement value of the thermal camera needs to be corrected to ensure the accuracy. In general, this is the system default setting.





**Button mode:** Short press  button to enter menu. The corrected temp changes 1°C for one time. Short

press  or  button, the adjust temp changes. Short press  button to confirm. Short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the menu to bring up the dialog box. Lightly tap the corrected temp column, enter the menu to slide up and down to set. Tap the Confirm button, tap the image icon to exit the current menu.

## Reflection Temp

Since the ambient temp is higher than the target temp, the target radiation may be received by the thermal camera together with the target surface radiation, and the measurement error is caused to the target temp measurement, corresponding compensation parameters.

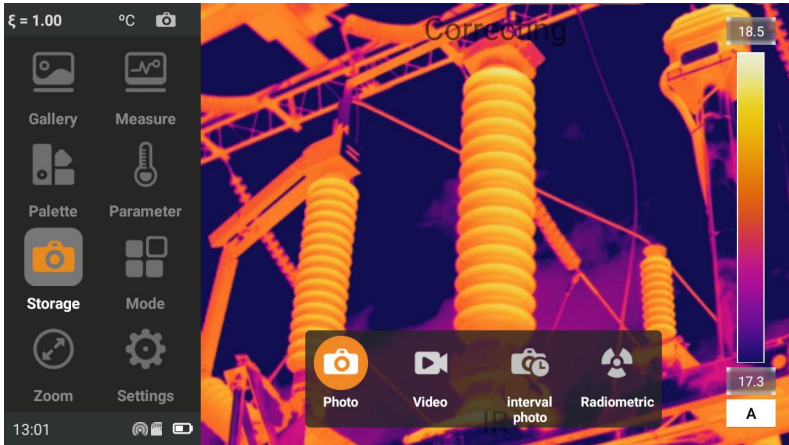
***Button mode:*** Short press  button to enter menu. The reflection temp changes 1°C for one time. Short press  or  button, the reflection temp changes. Short press  button to confirm. Short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the menu to bring up the dialog box. Lightly tap the reflection temp column, enter the

menu to slide up and down to set. Tap the Confirm button, tap the image icon to exit the current menu.

## **5) Storage**

There are 4 storage methods: **Photo, Record, Interval Photo, Radiometric**. The photo storage mode indicates that the current photo button is in the image storage mode, the record storage mode indicates that the current camera button is in the video storage mode. The interval photo storage mode means that the interval time is selected according to needs for automatic capture. The radiometric storage mode means that the recorded video can view the real-time temp. (The radiometric video needs to be opened and viewed in the PC software designated by the device. It cannot be viewed on the device.)



## Storage Interface


**Button mode:** Short press  $\wedge$  or  $\vee$  button to select the required function, short press  $\leftarrow$  button to confirm. Short press the return button to exit the current menu.

**Touch mode:** Lightly tap the required function, tap the image icon to exit the current menu.

## 6) Mode

There are infrared, visible light, gas, gas PIP and gad DSX mode options under the menu. Users can choose according to different temperature measurement objects.




**Button mode:** Short press  $\leftarrow$  to enter the mode interface, short press  $\leftarrow$  or  $\rightarrow$  to change the mode, short

press  to confirm, and short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the needed function. Lightly tap the storage icon to exit current menu.

***IR mode:*** The infrared thermal spectrum of the object can be displayed in front of you in the form of HD and high sensitivity pseudo color image.

***Visible light mode:*** In visible light mode, the most original state can be recorded.

***Gas mode:*** When there is gas leakage in the area, the gas mode can be selected for investigation. If there is little gas leakage, click  to open the high sensitivity function and adjust the parameters. There are 6 gears for high sensitivity and can be adjust through ,  buttons. When there is a lot of gas leakage, the high sensitivity function is not need to be turn on. This function can also be turned on in **Settings->High Sensitivity Mode**.

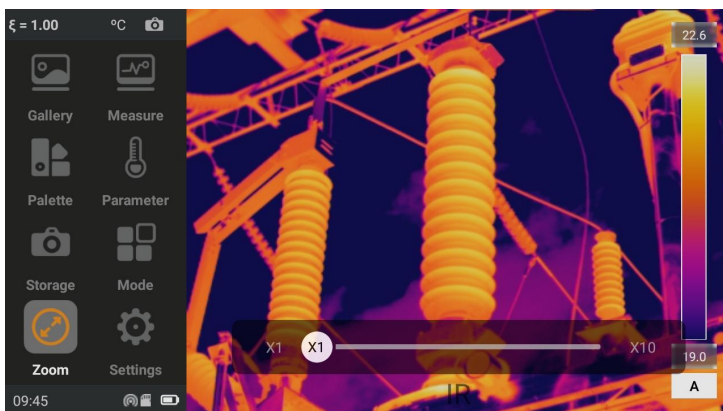
**Gas PIP:** On the basis of the gas mode, the upper left corner is superimposed with a visible light picture of the same field of view to distinguish the detection object more clearly.

**Gas DSX:** Overlay visible light edge contour details on

the basis of gas mode

## 7) Zoom

The zoom function is an electronic zoom of the real-time thermal image, which can be changed 1X-10X.



Zoom Interface

**Button mode:** Short press  $\langle$  or  $\rangle$  button to select zoom function, short press  $\downarrow$  button to enter menu, short press  $\langle$  or  $\rangle$  button, the zoom changes 1X for one time, short press the return button to exit the current menu.





**Touch mode:** Lightly tap the needed function, tap the storage icon to exit the current menu.

Note: Only infrared mode images can be zoomed, and images in other modes cannot be zoomed. The menu is grayed out

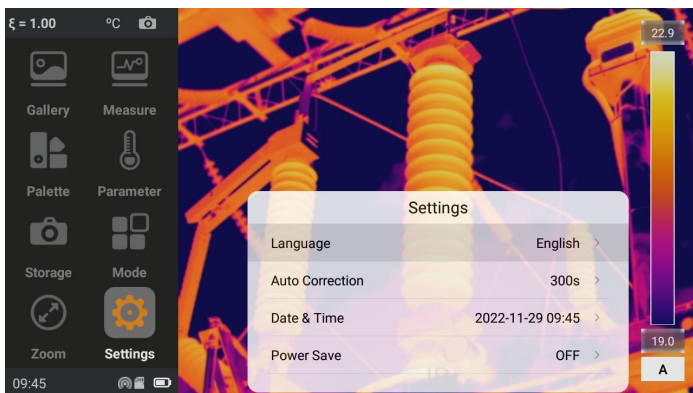
## 8) Setting

There are 24 options under the menu: **Language, auto zero time, date & time, power save, power off, screen brightness, OLED brightness, preset text, factory settings, SD card format, WIFI, GPS, BLUETOOTH, OLED, gas concentration detection, mode display, palette display, high sensitivity mode, USB mode, device and disk information, compatibility mode, image overlay information, customized short press and customized long press.**

***Button mode:*** Select the function to be modified.

Short press  button to enter menu. Short press  or  button to set parameters. Short press  button to confirm. Short press the return button to exit the current menu.

***Touch mode:*** Lightly tap the function to be modified. Enter the menu to slide up and down to set. Tap the Confirm button, tap the setting icon to exit the current menu.



## Language

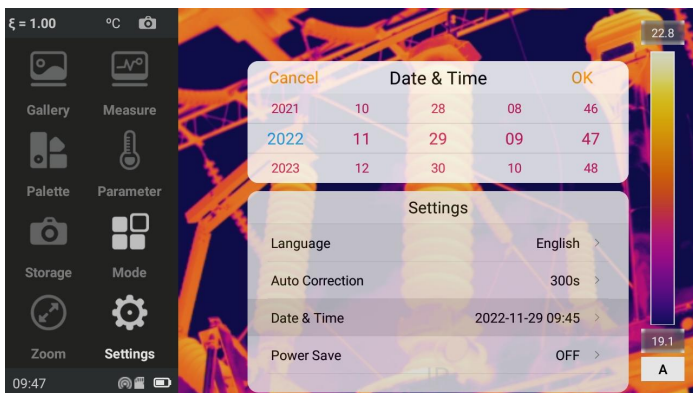
Simplified Chinese, English.

## Auto zero time

The automatic correction interval can be set between 120~900 seconds, close, level.

## Date & Time

Set the date & time of this device through the time setting menu. The clock of this device will still run for a while after the battery is taken out; if the battery is not installed for a long time, the clock will stop running and it needs to be reset after power on.



## Power Save

When there is no operation for a preset time, the device automatically turns off the LCD display, but does not turn off the power. Available in 10 minutes, 20 minutes, 30 minutes, 3 scheduled times, "Off" means that the display is not turned off all the time. After the display is turned off, users can short press any button except the power button to activate the device.

## Power Off

When there is no button operation within the preset time, the device will automatically turn off the power of the whole machine to save battery power. Available in 10 minutes, 20 minutes, 30 minutes, 3 scheduled times.

“Noun” means the machine will not actively shut down.

## Screen Brightness

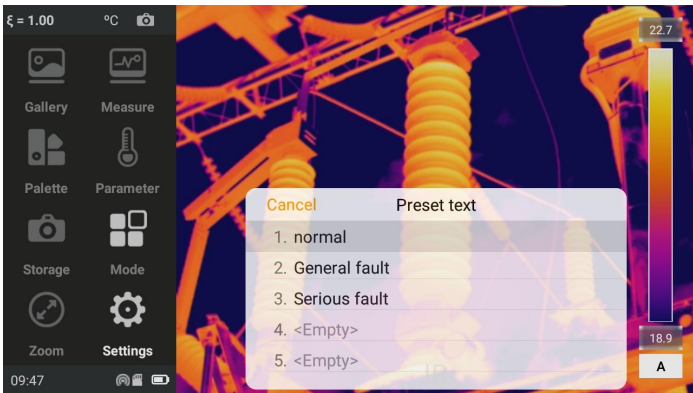
Users can adjust the LCD brightness in different lighting conditions. There are 5 adjustable brightness gears, which are 20%, 40%, 60%, 80% and 100% respectively.

## OLED Brightness

There are 5 levels of brightness that can be adjusted: 20%, 40%, 60%, 80% and 100%.

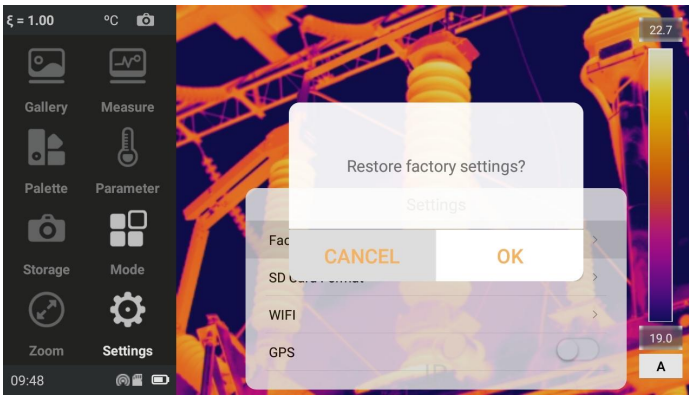
## Preset Text

Set text in advance for images and voice annotation. 30 preset texts can be set in total.



## Factory Settings

This setting is used to restore factory settings to correct some erroneous settings. The device will automatically restart after restoring the factory settings.

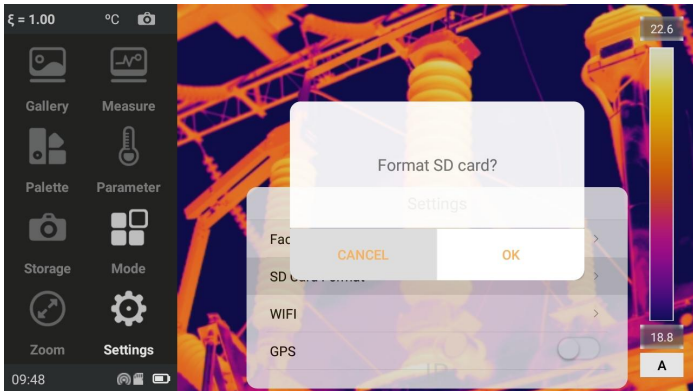


## SD Card Format

This feature enables formatting of the SD card of the device. Selecting this function, the dialog box "Format SD card?" appears, select the "Confirm" option to format the SD card immediately, select the "Cancel" option to exit the current operation.

Formatting will permanently delete all the original data of the SD card, please ensure that the data has been backed up before formatting.

If you can't save the image, please check the virus first. If there is no virus, you will need to copy and retain the data and then format the disk.



## WIFI

Step 1: Turn on the device Wi-Fi function. This function can be turned on in **Setting** → **WIFI**.



## WIFI Setting Interface

Use phone or computer to search WIFI. When the device is working, users can find WIFI name of the device number, such as "IR\_WIFI\_G330001" , Click on the Wi-Fi signal to complete the connection.

Step 2: If you are the users of Android, please download the application named "ES File Browsing" and open it. After the new interface appears, click the option to enter the server address (192.168.43.1), the port number is 2221, the username (admin) and password (admin). Once saved, you can preview or save the images.


If you are the users of iOS, please download the application named "FTP Manager" and open it. And then click the "+" at the top right corner and select "FTP" . After the new interface appears, click the option to enter the server address (192.168.43.1), the port number is 2221, the username (admin) and password (admin). Once saved, you can preview or save the images.

If you are the users of computer, you can choose any software to use.

## **GPS**

When GPS is turned on, the main interface will display the longitude and latitude of the device location.

## **Bluetooth**

Tap the Bluetooth column or the short press  to enter the picture Bluetooth interface, tap the Bluetooth column to enter the Bluetooth connection interface, open the Bluetooth switch in the upper right corner, turn on Bluetooth to automatically search for Bluetooth devices within the device range, or click Refresh to search for Bluetooth devices. At the same time, turn on the Bluetooth headset and the headset will enter the pairing status, after the device search is completed, click the corresponding Bluetooth headset to pair. It prompts that the pairing is in progress, and then displays connected, indicating that the pairing completed.

## **OLED**

Select Open to light up the micro display; If OFF is selected, the micro display will not light up. The default state is off.

## **Mode display**

When the mode display is turned on, the main screen will display according to the mode: GAS mode, IR mode, VIS mode.

## **Palette display**

The color bar can be turned on or off.

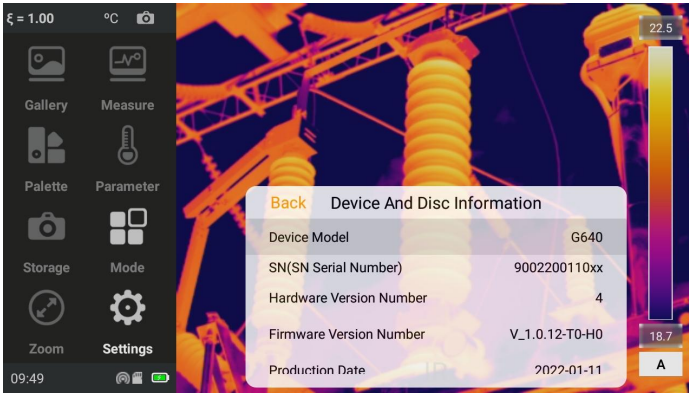
## **High sensitivity mode**

Turn on the high sensitivity function and adjust the parameters. There are 6 gear options for high sensitivity.

## **USB mode**

USB device selection, USB devices have file transfer, video. File transfer is U disk, which can operate the stored contents on the device through PC, including image export and deletion; The video content on the device can be previewed under real-time image transmission.

## Device and Disk Information



This menu displays device information such as device model, device number, hardware version number, firmware version number, production date, and disk used capacity and disk free capacity query.

### Compatibility mode

Select Open, and the compatibility mode function is turned on; If you select Close, the compatibility mode feature is turned off.

### Image Overlay Information

Turn on the image overlay information, when the storage mode is taking photo, the emissivity, distance, ambient temperature, humidity of the currently captured image will appear at the bottom part of the screen.

## **Custom Short Press and Long Press**

Some specific functions can be set to this button through menu setting, and the two functions can be called by short press and long press, which is convenient for customers to customize operations according to their personal habits. (For example, color palette switching, zero adjustment, laser, fill light, etc.)

### **9) Laser Light**

Turn the laser light on or off.

**Be careful not to point the laser at people's eyes.**

### **10) Fill Light**

The device fill light button. Short press this button to turn on or off.

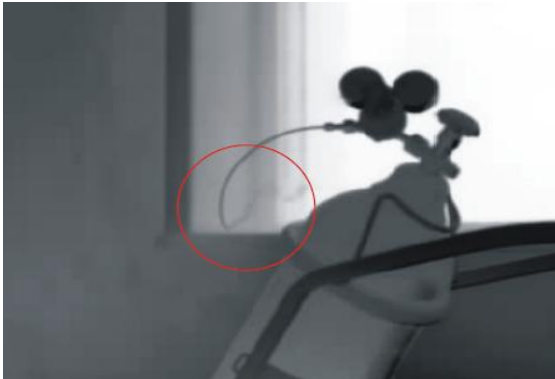
### **11) Zero Adjustment**

Click the zero button, device will automatically zero, at this time the image is the best.

## VI. Gas Leakage Detection Mode

Switch the mode into the gas detection mode, and then aim the device at the target. Users can pinpoint the leakage location of gas accurately. As shown in the figure, users can see the leakage of SF<sub>6</sub> gas in the red area

In gas mode, **high sensitivity mode** can be turned on and high sensitivity and gain can be set. The high sensitivity function can be turned on or off by clicking the >key. There are 6 gears for high sensitivity, and the gear can be adjusted by pressing ^, v. When there is a large amount of leaking gas, the high sensitivity function cannot be turned on.



Gas leakage diagram of gas detection mode

Focusing is very important to get a clear gas imaging, for different scenes, users need to manually rotate the lens adjustment hand wheel or electrically adjust the far focus and near focus.

Turn lens in clockwise for near focusing, far focusing counterclockwise.

## VI. Technical Specification

Imaging performance and optical parameters	
FPA	Cooled long-wave infrared detector
Spectral range	10.3–10.7 $\mu$ m
Measure	
Accuracy	Temp range (0-100 °C) $\pm 1^{\circ}\text{C}$ or temp range reading ( $> +100^{\circ}\text{C}$ ) $\pm 2\%$
Temperature range	-40°C ~ +50°C; +0°C ~ +250°C; +200°C ~ +500°C
Temperature measurement mode	Manual/automatic, set temperature measuring point, area (the highest and lowest temperature can be set in the area), isotherm and temperature difference, with sound alarm and color alarm, and real-time automatic tracking the highest/lowest temperature points
Measurement analysis	

Spot measure	10, including highest/lowest/average value
Area measure	5, including highest/lowest/average value
Line measure	5, including highest/lowest/average value
Circle measure	3, including highest/lowest/average value
Temperature difference	Temperature difference between measured values or reference temperatures
Reference temperature	Manual or obtain according to measurement
Emissivity correction	Adjustable from 0.01 to 1.0 or selected from editable material table
Measurement correction	Reflection temperature, distance, emissivity, humidity, ambient temperature
Battery system	
Battery operating time	> 3 hours (typical application at ambient temperature of 25°C)
Startup time	Generally within 12 minutes (at 25°C)
General parameters	
Lens recognition	Support
FOV	14° Lens: 14° x 11.2° 24° Lens: 24° x 19.3°
F-number	1.2
Focusing	Auto/manual
Zoom	1-10x continuous digital zoom
Digital image enhancement	High sensitivity mode

Infrared image resolution	640×512 Pixel
NETD/Sensitivity	<15 mK @ +30°C
Gas sensitivity	≤0.001ml/s
Electronic devices and data transmission rate	
Frequency	50 Hz
Image display	
Display	5"LCD 1280×720 Pixel touch screen
Viewfinder	OLED, 1024 ×768 Pixel
Image mode	Gas mode, infrared mode, visible light mode, high sensitivity mode, gas PIP, gas detail enhancement
Settings	
Palette	Iron red, green red, yellow hot, rainbow, warm color, high contrast 1, high contrast 2, cold color, white hot, black hot, blue green red, blue red, reversed phase
Image storage	
Image storage type	SD card max supports 128G
Image storage capacity	Each GB can store about 250 groups of pictures (infrared + visible light, excluding text and voice annotation)

Image storage mode	Infrared/visible light image Visible light image automatically associates the corresponding thermal image, 60s voice annotation, and 150 characters text annotation
Periodic image storage	Support
File Type	Standard JPEG
GPS	Support
Video recording and video streaming	
Non-radiant infrared video recording	Mp4 record to memory card
Visible light video recording	Mp4 record to memory card
Digital camera	
Built-in digital camera	5 megapixel visible light module
Laser indicator	
Laser	Support
Data communication interface	
WI-FI	Built in Wi-Fi module
Bluetooth	Built in Bluetooth module
USB standard	Type-C
Video	micro HDMI Interface digital video output
Power System	
Battery voltage	9.5V~12.6V

Adapter voltage	14V 3A
Environment Parameters	
Operating temperature range	-20°C ~ +50°C
Storage temperature range	-30°C ~ +60°C
Humidity	≤90%(non-condensing)
EMC	Meet the requirements of Q/GDW11304.1-2015 5.7.1
Encapsulation	IP 54 (IEC 60529)
Impact resistance	25 g Meet the requirements of Q/GDW11304.1-2015 5.5.4
Vibration resistance	2 g Meet the requirements of Q/GDW11304.1-2015 5.5.3
Sulfur Hexafluoride (SF6) • Acetyl Chloride • Acetic Acid • Allyl Bromide • Allyl Chloride • Allyl Fluoride • Ammonia (NH3) • Methane Bromide • Chlorine Dioxide • Ethyl Cyanoacrylate • Ethylene • Furan • Hydrazine • Methylsilane • Methyl Ethyl Ketone • Methyl Vinyl Ketone • Acrolein • Propylene • Tetrahydrofuran • Trichloroethylene • Uranyl Fluoride • Vinyl Chloride • Acrylonitrile • Vinyl Ether	

## VIII. Simple Fault Diagnosis and Elimination

For common problems arising during operation, please refer to the following table. If the problem cannot be settled, please cut off the power of the device and contact our technical department.

Failures	Causes and Solutions
The infrared camera can't start	<ul style="list-style-type: none"> <li>● The battery is uninstalled or improperly installed. →Insert the battery or re-install the battery.</li> <li>● The battery power runs out. →Replace or charge the battery.</li> <li>● Infrared camera shutdown for protection. →Wait 20 seconds and then restart.</li> </ul>
The infrared camera shuts down automatically	<ul style="list-style-type: none"> <li>● The battery power runs out→ Replace the battery.</li> </ul>
Battery power runs out fast	<ul style="list-style-type: none"> <li>● Ambient temp is too low or too high.</li> <li>● The rechargeable battery is not fully charged. →Recharge the rechargeable battery.</li> <li>● The life of battery is almost over,</li> </ul>

	about 300 cycles of charge and discharge for the type of battery. →Replace rechargeable battery.
No thermal image displayed	<ul style="list-style-type: none"> <li>● Lens cap is not open.→Open the lens cap.</li> </ul>
Thermal image becomes black and white	<ul style="list-style-type: none"> <li>● Whether black and white color code is selected→Restore factory settings.</li> </ul>

## IX. Appendix: Emissivity of Raw

### Material

(For Reference Only)

Material	Surface	Temp(°C)	Emissivity(ε)
Aluminum	Non-oxidized	100	0.20
	Oxidized	100	0.55
Brass	Brown Polished	20	0.40
	Unpolished	38	0.22
	Oxidized	100	0.61
Copper	Oxidized badly	20	0.78
Iron	Oxidized	100	0.74
	Rusted	25	0.65
Cast Iron	Oxidized	200	0.64
	Non-oxidized	100	0.21
Wrought Iron	Rough	25	0.94
	Polished	38	0.28
Nickel	Oxidized	200	0.37

Stainless Steel	Oxidized	60	0.85
Steel	800°C Oxidized	200	0.79
General Brick	Surface	20	0.93
Concrete	Surface	20	0.92
Glass	Smooth Flat	20	0.94
Lacquer	White	100	0.92
	Natural Black	100	0.97
Carbon	Smoky black	25	0.95
	Candle Smoke	20	0.95
	Graphite rough surface	20	0.98
Paint	16 Color Average	100	0.94
Paper	White	20	0.93
Sandy Soil	Surface	20	0.90
Wood	Planed	30	0.90
Water	Distilled Water	30	0.96
Skin	Human	32	0.98
China	Fine	21	0.90
	Rough	21	0.93



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