

# T12-M

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## User's manual



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# **! WARNING, CAUTION AND ATTENTION**

## **Definition**

- !** A warning represents a dangerous situation or action that could result in personal injury or death.
- !** Caution represents a condition or action that may result in damage to the camera or permanent loss of data.
- !** Attention represents useful information for the user.

## **Important – Read before using the instrument**

- !** **WARNING** – This instrument has a built-in laser transmitter. Do not stare at the laser beam. The laser specification is 635 nm, 0.9 mW, second order.
- !** **CAUTION** – As the camera uses a very sensitive thermal sensor, under no circumstances (power on or off) should the lens be aimed directly at a strong radiation source (such as the sun, direct or reflected laser beam, etc.), otherwise the camera will be permanently damaged!
- !** **Caution**-The original packing box must be used during transportation. Do not shake or hit the thermal imager strongly during use and transportation.
- !** **CAUTION** – It is recommended that the camera be stored in the original container in a cool, dry, ventilated environment free of strong electromagnetic fields.
- !** **CAUTION**-Avoid staining and damaging the lens surface with oil and various chemicals. After use, close the lens cap.
- !** **Caution**-To prevent potential data loss, copy (back) the data to your computer frequently.
- !** **Note**-The camera may require a 3-5 minute warm-up period before accurate readings can be taken.
- !** **Note**-Temperature calibration is performed on each thermal imager when it leaves the factory. It is recommended to perform temperature calibration every year.
- !** **CAUTION**-Do not open or modify the enclosure without authorization. Only authorized personnel of the company can carry out maintenance.

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# 1 Introduction

Thank you for choosing T12-M infrared thermal imager from Zhejiang Dali Technology Co., Ltd.

## Main functions

Measurement of maximum temperature, minimum temperature and 15 movable points

Temperature measurement in 15 movable areas

8 arbitrary lines for temperature measurement

16 color codes to choose from

Infrared and visible image fusion

Isothermal function

Temperature measurement settings

Fusion of high and low temperature

Built-in common material emissivity meter

Manual and automatic integrated focusing

Multiple interchangeable independent lenses

5 "LCD High Brightness Display

LCD brightness adjustable

Capacitive touch screen

13 million visible light cameras

LED fill light

Laser rangefinder

WiFi

Bluetooth headset

GPS Positioning and Electronic Compass

SD card image storage

USB-C data transfer

HDMI video output

Single or continuous shooting storage

Live video

Time recording

Voice or text annotation

Custom Shortcut Key  
Power saving mode  
Multilingual  
Time/Date Settings  
Restore factory settings

## **Upgrade options**

Optional wide-angle lens (0.5 X), medium lens (2 X) or telephoto lens (3 X);

It can extend the temperature measurement at high temperature and improve the temperature measurement range at high temperature.

## **Main applications:**

### **Preventive maintenance**

- Power industry: thermal state inspection of transmission lines and power equipment, fault and defect diagnosis.
- Electrical system: pre-identify circuit overloads before they occur.
- Mechanical systems: reduce downtime and prevent failures.

### **Building Science**

- Roofs: Detect and detect water seepage quickly and efficiently.
- Building structure: conduct infrared energy assessment survey for commercial and residential buildings.
- Moisture Detection: Find the source of dampness and mold.
- Repair: Evaluate the remedy and make sure the area is completely dry.

### **Other applications**

- Iron and steel industry: monitoring of steelmaking and rolling process, diagnosis of hot blast stove damage, temperature detection of plate blank, etc.
- Fire protection: forest fire prevention and potential fire source search, special material spontaneous combustion prevention and detection, electrical fire safety detection.
- Medicine: body surface temperature detection and temperature field distribution analysis.
- Petrochemical industry: inspection of oil pipeline status, inspection of material interface, inspection of heat leakage and thermal insulation structure, inspection of power equipment status, etc.

## **1.1 Standard configuration**

- Thermal imager (armrest)
- Carry case
- Rechargeable Batteries (2)
- National standard charger
- Battery charging stand
- Lens cover
- User manual, report analysis system CD
- SD card
- SD card reader
- USB cable
- HDMI video cable

## **1.2 Optional configuration**

- 0.5 times wide-angle Lens
- 2x medium focal lens
- 3x telephoto lens
- Portable backpack
- Non-GB (European Standard/British Standard/Australian Standard) charger



## 2 Introduction to thermal imagers

### 2.1 Function key



### **[1] Power key**

Used for turning the camera on and off, standby, and wake-up. Press the switch for more than three seconds to turn the camera on/off; press briefly to enter standby/wake-up.

**! Note: It is recommended to wait for at least ten seconds after shutdown to ensure the safety of the camera.**

### **[2] Mode key**

Used for image mode switching. Short press to switch the image mode. There are four image modes to choose: infrared, visible light, picture-in-picture and dual-band fusion image.

### **[3] Back key**

- In menu/edit mode, press briefly to cancel the current menu operation or return to the previous menu.

### **[4] Photo key**

Use to freeze or save an image. Press the key once to freeze the image, press the key again to save the image, and press the back key to return to active mode. Press and hold for 3 seconds to record. At this time, press and hold to stop recording and save the video. The photo key can be set as a custom shortcut key.

### **[5] Trigger key**

The trigger key defaults to the laser key. Click the laser key to turn the laser rangefinder on/off. The trigger key can be set as a custom shortcut key.

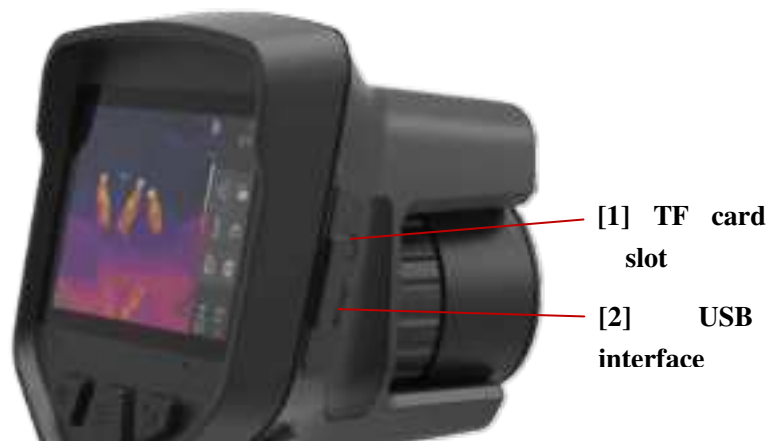
### **[6] Manual focusing ring**

When facing the LCD screen, the operator rotates the focusing ring clockwise to focus in the far focus direction, and rotates the focusing ring counterclockwise to focus in the near focus direction.


### **[7] Microphone**

Used for voice annotation when saving images.

## 2.2 Interface



### [1] TF card slot

Using a standard TF card,  Used to save images and upgrade instrument software.

### [2] USB interface

For random charging and data transmission and video output.

## 3 Basic operation

### 3.1 Battery installation and replacement

#### 3.1.1 Battery handling

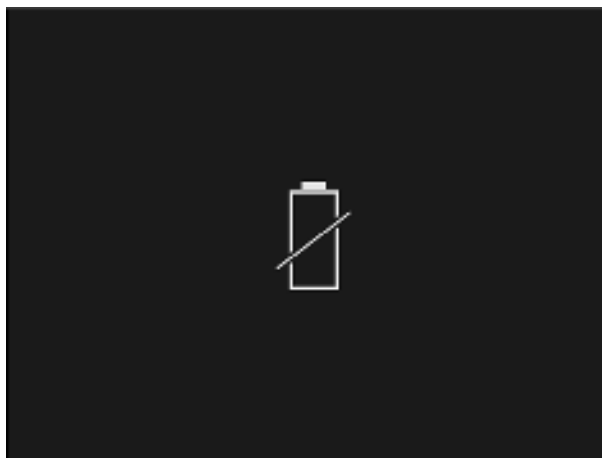
The battery is in the camera key handle of the instrument, and the end of the handle is the battery cover.

The battery can be pulled out by pressing the U-shaped elastic area on both sides of the battery cover and pulling outward.

When inserting the battery, the battery is designed with a fool-proof structure. If it cannot be inserted, please change the direction to insert it. When the battery cover is pushed inward and a "click" is heard, the battery has been installed and self-locked, and the instrument can be used.

#### 3.1.2 Replace the battery

When the battery symbol is blank and blinking, it indicates that the battery has been discharged and the battery should be replaced. The instrument will automatically shut down after displaying the low power prompt.



Shutdown prompt

## 3.2 Common sense of safe use of battery

- The battery shall be stored at the ambient temperature of -20 °C and 20 °C as much as possible. As the battery has a small amount of self-discharge during storage, the battery shall be fully charged and charged at regular intervals to avoid the possible over-discharge during storage that may affect the battery capacity. The time interval is as follows:
  - Ambient temperature is -20 °C 20 °C, once every 6 months;
  - The ambient temperature is 20 °C 45 °C, once every 3 months;
  - The ambient temperature is 45 °C 60 °C, once a month.
- Each charge must be more than 50% of the battery capacity.
- The battery should be charged at an ambient temperature of 0 °C 40 °C. Charging at an ambient temperature of 0 °C will reduce the capacity of the battery. Charging at a temperature above 40 °C may cause the battery to overheat and be damaged.

### **! Warning:**

**! Do not disassemble, squeeze or stab the battery;**

**! Do not short-circuit the external contacts of the battery;**

**! Keep the battery dry and do not place it in fire or water;**

**! Do not place in a place easily accessible to children;**

**! Dispose of waste batteries in accordance with local government regulations.**

### 3.3 Lens loading and unloading

Align the red dot of the lens with the red dot in the instrument, carefully insert it to the end, and rotate it clockwise (in the direction of the red arrow) for about 50 ° until it cannot be rotated (there is a sense of positioning), and the installation is completed.



When removing, turn the lens counterclockwise (in the direction of the red arrow) to the end, and then take it out carefully.



## 3.4 Quick start

### 3.4.1 Get a thermal image

- After installing the battery, press and hold the camera power switch (more than 3 seconds) until the power light turns green. After about 15 seconds, the instrument is initialized and enters the working state.
- Open the lens cover, aim at the target, and use the focusing wheel to focus the thermal imager, so that the target image is clear.
- Double-tap the screen to autofocus the camera.

**! Note: The focus is not clear, which may lead to measurement errors.**

### 3.4.2 Temperature Measure

- Move the cross temperature measuring point in the screen to the target object, and the "XX" displayed in the upper left corner of the screen is the temperature of the target at the temperature measuring point. See "4.2 Temperature Measurement Mode" for details of adding temperature measurement objects.
- If you want to measure the temperature of the current thermal image displayed on the screen in detail, you can store the thermal image for further analysis.
- When the target temperature is higher or lower than the upper or lower limit temperature corresponding to the temperature measurement position of the thermal imager, the screen temperature will display  $> XXX\text{ }^{\circ}\text{C}$  or  $< XXX\text{ }^{\circ}\text{C}$  to prompt the user.
- If you need to set the attribute of the temperature measurement object, click the object on the touch screen to select it, and then press the setting icon at the bottom right of the screen to enter the attribute setting menu of the temperature measurement object. After setting, click the arrow at the top left corner of the screen to return to the active image. The following are the attribute setting menus of temperature measuring point, temperature measuring line and temperature measuring area:



Temperature measurement area attribute setting menu

Click the selected temperature measuring point, and press and hold the point to drag it directly within the screen range. There are three items in the temperature measurement point attribute setting menu: specific radiation coefficient, distance setting and local parameter. When the local parameter switch is on, the emissivity and distance of a single temperature measurement target can be set.

Click to select the temperature measuring line, and hold the middle point on the line to drag the temperature measuring line as a whole; hold any point at both ends of the line to drag one end of the temperature measuring line to change the direction and length of the line. The temperature measuring line attribute setting menu has four items: specific amplitude coefficient, distance setting, local parameter and analysis setting. Under the analysis setting, there are submenus: maximum temperature, minimum temperature, average temperature and maximum temperature difference.



Temperature measurement area analysis setting submenu

Click to select the temperature measurement area, press and hold the middle point of the area to drag the temperature measurement area as a whole; press and hold any point of




the four corners of the area to drag the corner of the temperature measurement area to change the size of the area. The temperature measurement area attribute setting menu has four items: specific amplitude coefficient, distance setting, local parameter and analysis setting. Under the analysis setting, there are submenus: maximum temperature, minimum temperature, average temperature and maximum temperature difference.

- If you want to set the temperature measurement object as a "reference object", refer to "4.8.2 Temperature Measurement Function Settings".


**! Note: Only one reference temperature measurement target can be set for the thermal imager.**

### 3.4.3 Store the image

To store the acquired current image, one of the following two methods can be selected:

- Press the store key or click the "Picture" icon on the touch screen ? Select the "Photo" icon in the menu, and the system will automatically save the image.
- Press the store key. After the image is frozen, press this key again to save the image.

### 3.4.4 Play back the image

- Click to select the "Playback" icon on the touch screen  Pop up the picture library, select the folder or image to be played back, and play back the image
- Click to select the image library, and you can edit the image for the second time, record it, make a report, upload it to the cloud, and delete it.

### 3.4.5 ExportImage

- The card reader can be used to operate the data stored in the TF card, including image export, deletion, formatting and other operations.
- USB data cable can be connected to the computer to operate the data stored in the TF card of the thermal imager, including image export, deletion, formatting and other operations.

**! Note: It is recommended to format the TF card by using the format function in the thermal imager solidification software.**

### 3.4.6 LCD screen settings

- Press the pull-down menu or click the touch screen setting icon to enter the "Settings" menu. → "System Settings" → "Power saving mode setting" → Under "Brightness Adjustment", set the LCD brightness.

### **3.4.7 Menu operating instructions**

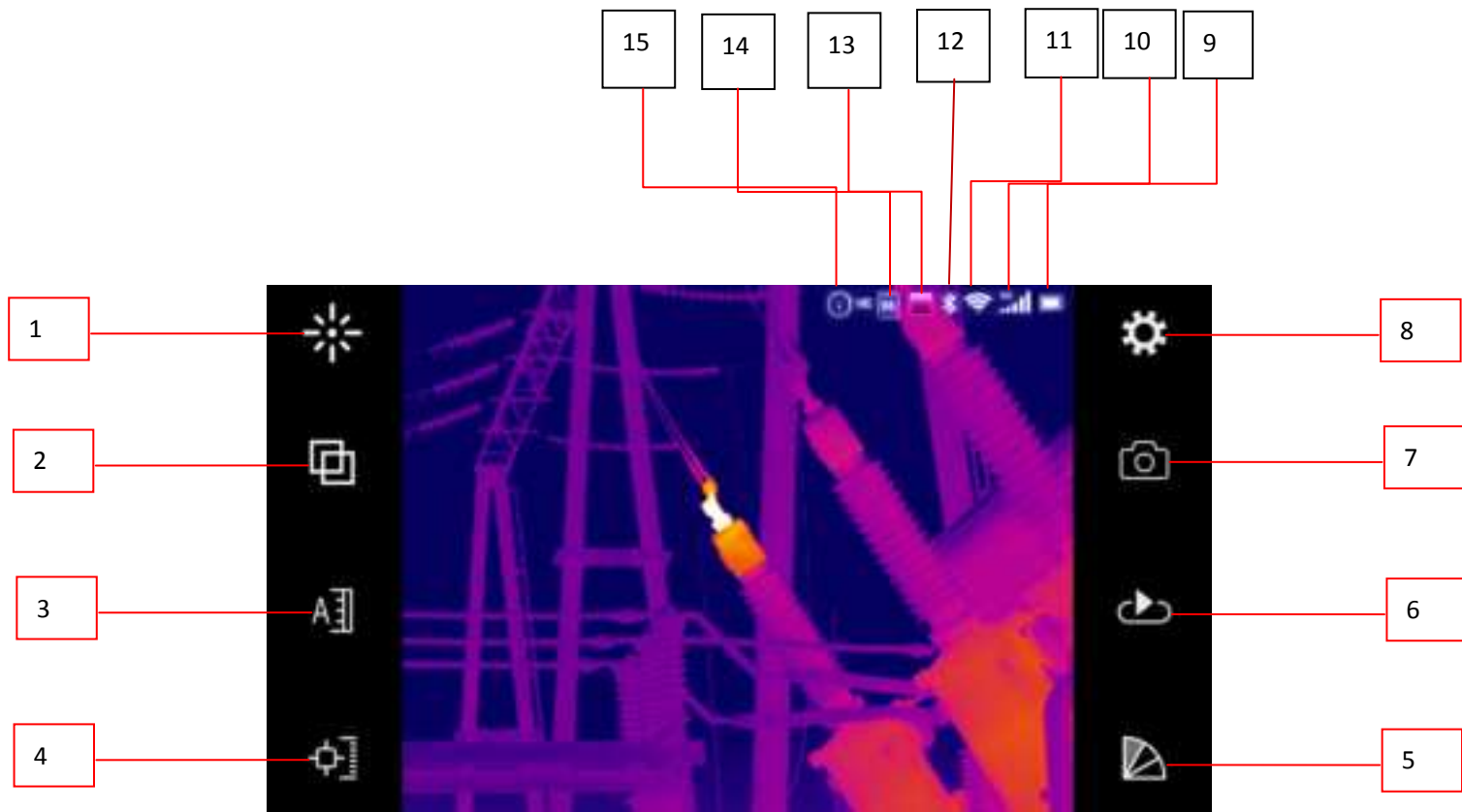
Touch screen operation:

- Click the icons on both sides of the touch screen, and click each icon for corresponding operation. Enter the setting menu, click the menu item to be set, enter the next level of submenu, the last level of menu for function switch, parameter setting, option selection and other operations; click the arrow sign in front of the interface name, return to the previous level of menu.
- Click the pull-down shortcut menu on the touch screen to switch on/off WiFi, Bluetooth and LED lights. Click the clear screen icon to clear the main interface UI, open/close GPS, hotspot and QR code scanning functions, enter the panoramic mode to take photos, and set the screen brightness.

# 4 Operating instructions

## 4.1 Description of operation interface

### 4.1.1 User interface of thermal imager working status



**[1] Laser ranging:** This function is used to turn on/off the laser. After turning on, laser indication and laser ranging can be performed.

**[2] Image mode switching:** It is used for image mode switching. There are four image modes available, including infrared, visible light, picture-in-picture and dual-band fusion image.

**[3] Image adjustment:** This function is used for manual/automatic mode selection of image adjustment.

**[4] Temperature measurement mode:** This function is used to add or delete temperature measurement objects, including temperature measurement points, temperature measurement areas, temperature measurement lines, etc.

**[5] Color scale switching:** This function is used to select the color scale for image display. There are 17 color scales available.

**[6] Image playback:** This function is used to browse and play back the saved image and video files.

**[7] Image storage:** This function is used to save images. Short press to take a picture and long press to record a video.

**[8] Setting function:** This function is used to set various parameters of the thermal imager, including temperature measurement parameter setting, temperature measurement function setting, image setting, storage setting, task mode setting, connection setting, system setting, etc.

**[9] Battery status:** displays the current battery charge status

**[10]**

**[11] WIFI status:** indicates that the current WIFI function is enabled.

**[12] Bluetooth status:** indicates that the Bluetooth function is currently enabled.

**[13] Image mode standard:** indicates that the current image mode is infrared mode.

**[14] Remaining capacity of memory card:** indicates the remaining capacity of memory.

**[15] Electronic compass:** displays the direction of the current electronic compass.

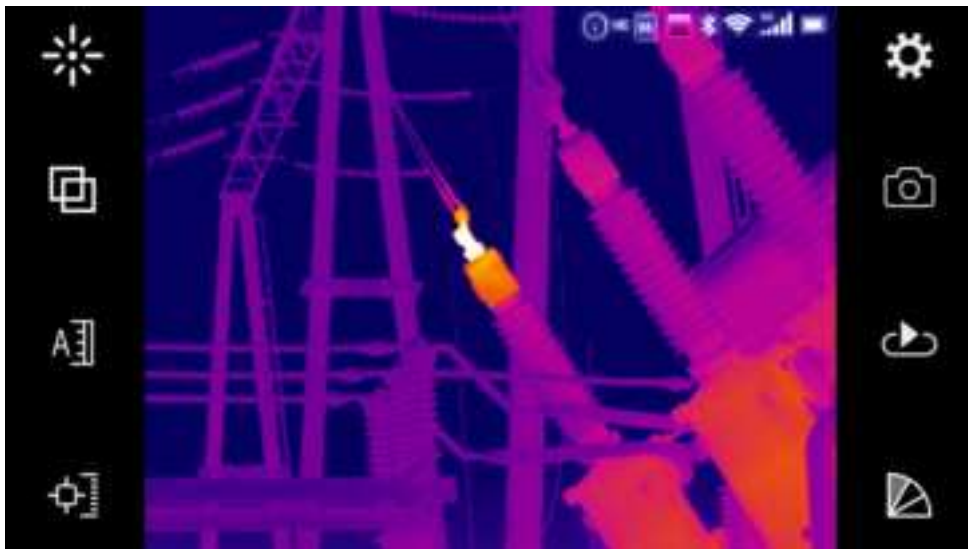
### 4.1.2 Drop-down menu



**Drop-down menu interface**

**Drop-down menu interface:** click the corresponding icon to turn on/off WIFI, mobile data, Bluetooth, LED fill light, hotspot, GPS, LED fill light, fusion distance, power saving mode, clear screen and panorama, and click the clear screen icon to hide the parameter data of the main interface UI. Click on the corresponding icon to enter the panoramic photography mode and sweep mode. Screen brightness and instrument volume can be adjusted.

### 4.1.3 Main menu interface



**Main menu interface**

**Main menu interface:** the icons from the left to the right of the main menu are Laser Ranging, image mode switching, image adjustment, temperature measurement mode, setting menu, photographing, image playback and color code selection.

## 4.2 Laser

This function is used to turn on/off the laser, and laser ranging can be performed when it is turned on



Laser ranging

## 4.3 Image mode switching

This function is used to switch between image modes, including infrared mode, visible light mode, fusion mode, and picture-in-picture mode.

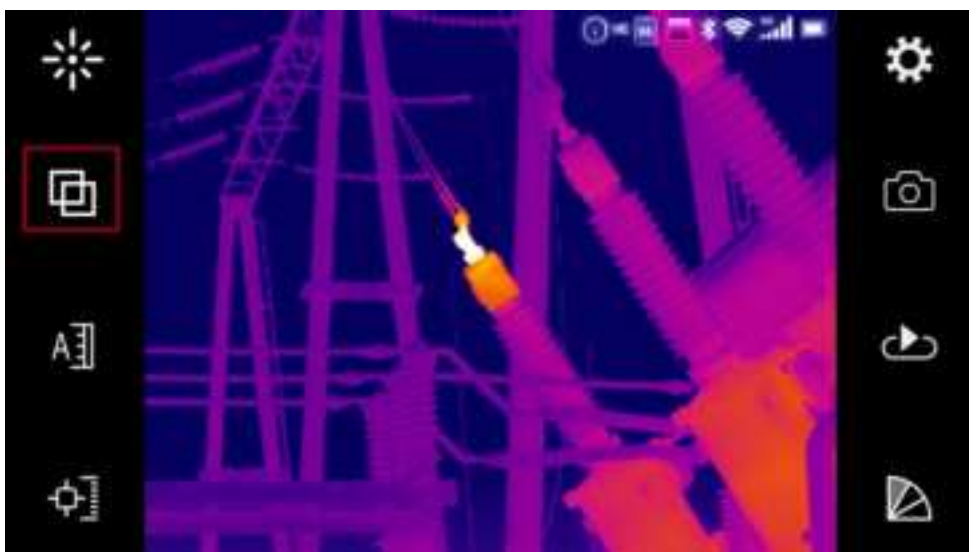


Image mode switching

## 4.4 Image adjustment

This function is used for manual/automatic mode selection of image adjustment.

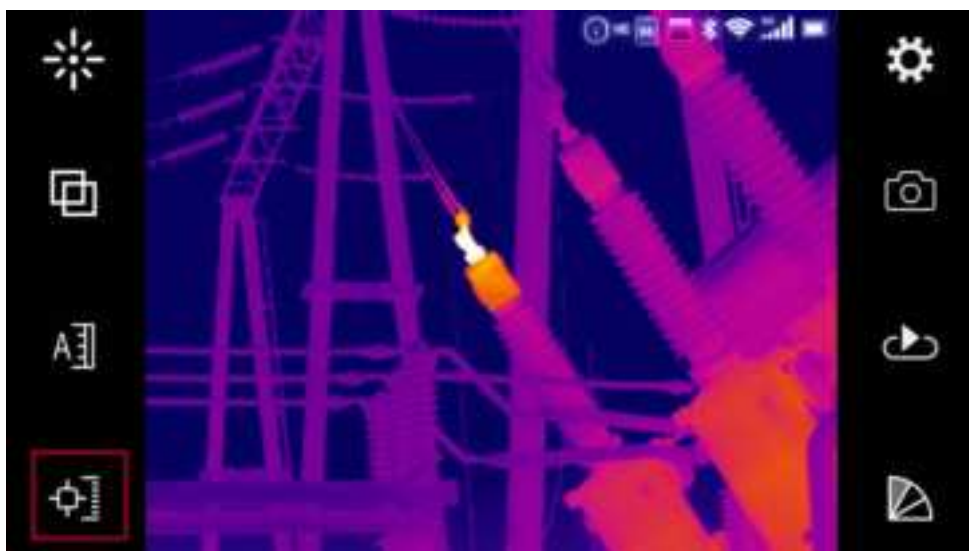
In the manual adjustment mode, click to select the upper and lower limit temperature values of the color scale, and slide your finger on the touch screen to adjust the upper and lower limit temperature values of the color scale respectively or simultaneously. Click the selected temperature value again to deselect it.



Image adjustment

## 4.5 Temperature measurement mode

According to the measurement needs, directly click the temperature measurement point, temperature measurement area, temperature measurement line and other temperature measurement object icons on the touch screen, and add the temperature measurement point, temperature measurement area, temperature measurement line and other temperature measurement objects on the screen. Click the delete icon on the far right to clear all the added temperature measurement objects.



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rement mode

## 4.6 Color scale switching

This function is used to select the color scale of the image display. There are 17 color scales to choose from.



Color scale switching

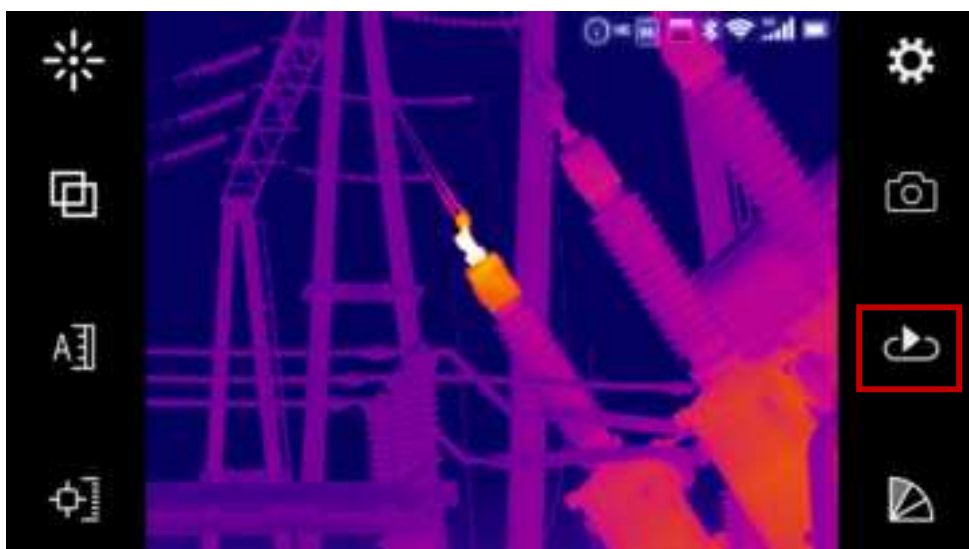
## 4.7 Image playback

This function is used to browse and play back the saved image and video files.

Click the playback icon on the touch screen to pop up the picture library interface, as shown in the following figure. Playback is divided into image library and report.

Enter the picture library and click the corresponding folder to open the folder.


Image playback





## 4.8 Image storage

This function is used to save images in JPG format.

Click on the touch screen, Click on the touch screen  Photo icon. Click the photo icon on the touch screen to save the current image directly.

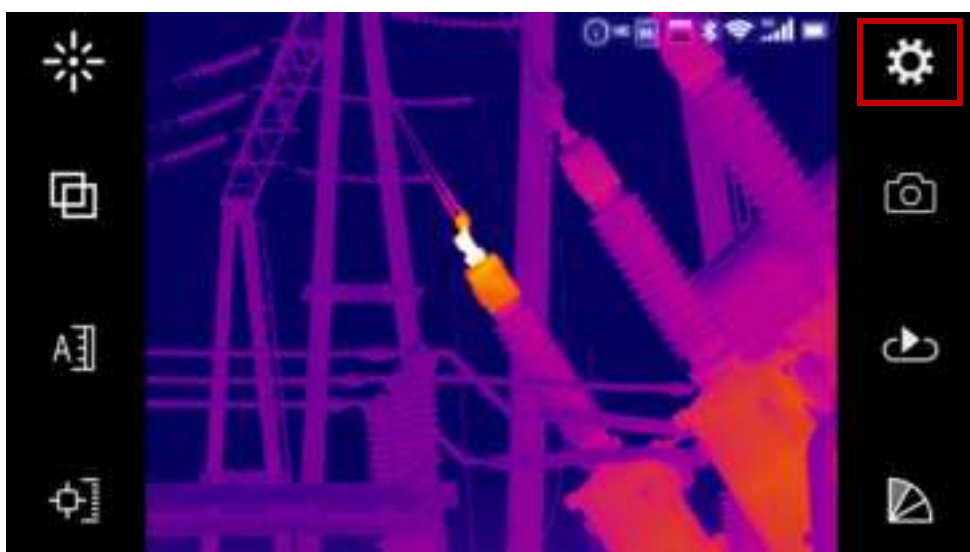
Another method of image storage operation is to press the store key to freeze the image and press again to save the image.



Camera interface

## 4.9 Set up

This function is used to set various parameters of the thermal imager, including temperature measurement parameter setting, temperature measurement function setting, image setting, storage setting, task mode setting, live detection management, connection setting, system setting, etc.



## Set up the interface

Click the main menu of the touch screen. Click the setting icon on the touch screen to pop up the setting menu interface, as shown below.



## Set the menu interface

After entering the setting menu interface, use the touch screen to operate the menus at all levels, which have been described in the 3.4.7 menu operation instructions and will not be repeated here. The following sections describe the contents of the setup menus at each level.

### 4.9.1 Temperature measurement parameter setting

In the temperature measurement parameter setting menu, there are temperature measurement gear setting, emissivity setting, ambient temperature setting, distance setting, humidity setting, background temperature setting, infrared window setting, correction temperature and other options.



**Temperature measurement parameter setting menu**

**Temperature measurement gear setting:** there are four gears that can be switched: -40~150 °C, 100-650 °C, 400-2000 °C (optional)


**Setting of specific amplitude coefficient:** select "Treatment according to surface material", and then select the corresponding material from the list of predefined materials; or select "Custom value", and then select the emissivity value of the target by scrolling up and down with the digital wheel or touching the screen.

**Ambient temperature setting:** The ambient temperature can be selected by scrolling up and down through the digital scroll wheel or touching the screen.

**Distance setting:** The distance of the target can be selected by scrolling up and down through the digital scroll wheel or touching the screen.

**Humidity setting:** The relative humidity of the environment can be selected by scrolling up and down through the digital scroll wheel or touching the screen.

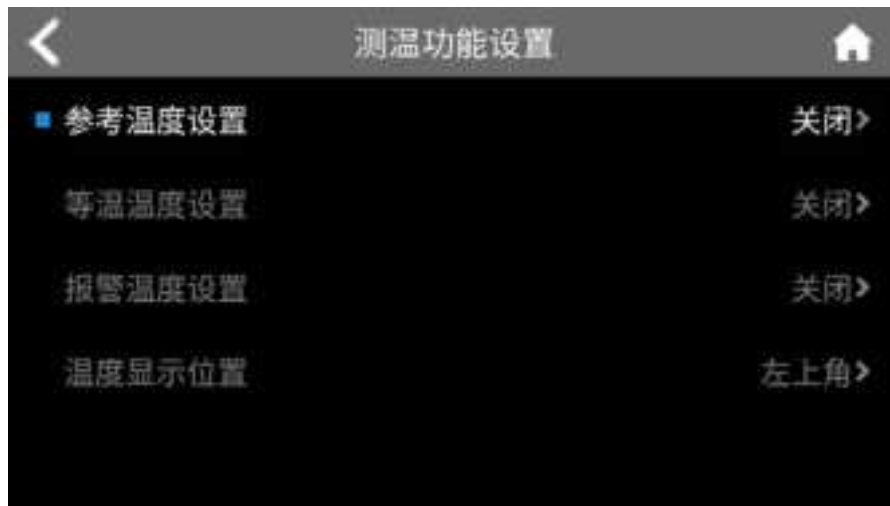
**Background temperature setting:** select the required background temperature value by scrolling up and down through the digital scroll wheel or touching the screen.

**Infrared window settings:** Click on the right side  Icon, on or off. When opening, select the window temperature and transmittance by touching the screen.

**Correction temperature:** Select the required correction temperature value through the touch screen.

## 4.9.2 Temperature measurement function setting

In the temperature measurement function setting menu, there are reference temperature setting, isothermal temperature setting, alarm parameter setting, Temperature display position and other functions



Temperature measurement function setting menu

**Reference temperature setting:** turn off or customize the temperature measurement target. The reference temperature can be selected by selecting a temperature measurement target or a user-defined value.

One temperature of point, line or area can be selected as the temperature measurement target, and only one reference temperature measurement target can be set; the reference temperature value can be selected through the digital roller or touch screen. Only temperature measurement target or user-defined can be selected, and only one of the two can be selected.



Reference Temperature Setup Menu

**Isothermal temperature setting:** Click on the right  icon, on or off. When it is turned

on, the required isothermal color can be selected, and the temperature values of the lower limit of the isothermal zone and the upper limit of the isothermal zone can be selected through the digital roller.



**Isothermal temperature setting menu**

**Alarm temperature setting:** set the alarm type first. When the alarm type is off, other options cannot be set. When the alarm type is set to high temperature alarm, it means that the alarm will be given when the temperature of the temperature measurement object is higher than the set alarm temperature; when the alarm type is set to low temperature alarm, it means that the alarm will be given when the temperature of the temperature measurement object is lower than the set alarm temperature.

After setting to high or low temperature alarm, other options can be set:

Alarm color setting, when the target temperature exceeds the set alarm temperature, the area exceeding the alarm temperature will be displayed in the set alarm color. The system provides 9 colors to choose from. When the alarm color is set to "Colorless", it means that the original color of the image will not be changed.

Alarm temperature setting, the required alarm temperature value can be selected through the touch screen.

Alarm linkage options, you can click to close, capture, video. If close is selected, there will be no alarm linkage. If snapshot or video recording is selected, the alarm will be automatically stored according to the selected type.

Time interval setting, the time interval (seconds) of alarm linkage (capture or video) can be selected through the touch screen.

Video recording time setting, the time (minutes) of each video recording can be selected

through the touch screen when the alarm linkage is recorded.



#### Temperature measurement parameter setting menu

**Temperature display position:**The temperature display position can select the upper left corner or the temperature measurement target through the touch screen.



#### Temperature Display Position Menu

### 4.9.3 Image settings

In the image setting menu, there are options such as thermal overlay, picture-in-picture transparency, zero time interval, national network protocol setting, super-resolution setting, etc.

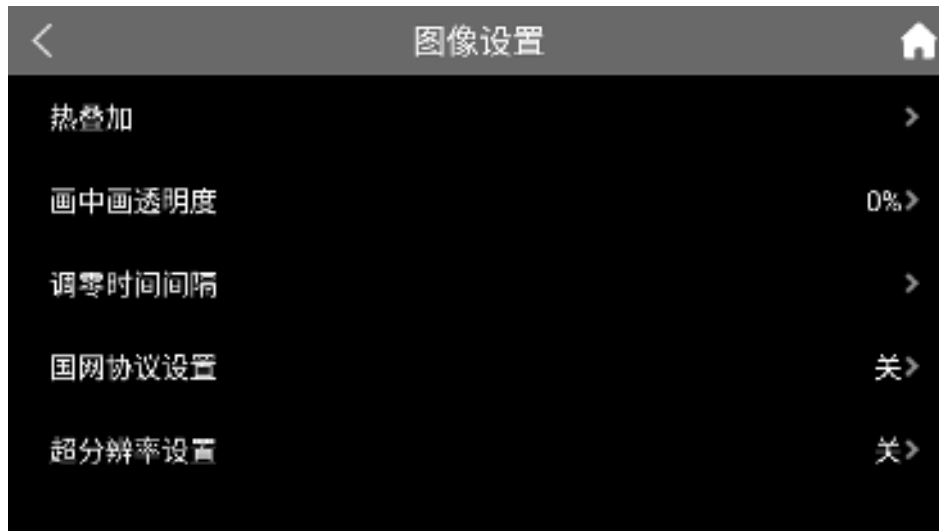


Image settings menu

**Heat Overlay:** Turn off or select High Heat Overlay or Low Heat Overlay. After selecting high temperature or low temperature thermal overlay, the thermal overlay threshold can be set.

**Picture-in-picture transparency:** Picture-in-picture transparency can be selected via the digital scroll wheel or touch screen

**Zeroing time interval:** Short zeroing (60s) or long zeroing (300s) can be selected or customized through the digital scroll wheel or touch screen.

**State Grid Protocol Settings:** Click on the right  icon, on or off.

**Super Resolution Settings:** Click on the right  icon, on or off.

### 4.9.4 Store settings

In the storage setting menu, there are options such as image annotation mode, continuous shooting setting, video recording setting, TF card formatting, storage directory setting, etc.



Storage settings menu

**Picture annotation mode:** You can select none or audio, text, sketch and other annotation modes.







**Continuous shooting settings:** The number of continuous shots and the interval between continuous shots can be set through the digital scroll wheel or touch screen.

**Video recording settings:** video format (MP4, dlv) can be selected, dlv is only used for infrared images.

**Built-in storage formatting:** Select OK to format the built-in storage, or Cancel to return.

**TF card formatting:** Select OK to format the TF card, or Cancel to return.

Note: Formatting will cause all information in the card to be lost.

**Storage directory setting:** You can select to customize the directory or automatically generate the storage directory by month or by day. Customize the directory and click the icon in the upper right corner of the image library interface  Icon to add a folder; activate  Icon to edit the folder, click  Icon to return to the home page, click  Icon to delete the folder, click  Icon, to rename the folder, click  Icons to select all.

#### 4.9.5 Task mode settings

In the task mode setting menu, there are task mode switch, task package, task import selection, transparency setting and other functions.





**Task mode setting interface**

**Task mode switch:** right side can be clicked  Icon, on or off

**Task Package:** After importing the task package, you can select the corresponding task package

**Task Import Selection:** You can import the corresponding task package


**Transparency setting:** the transparency can be selected through the touch screen


## **4.9.6 Connection settings**


In the connection settings menu, there are WIFI settings, Bluetooth settings, hotspot settings, USB settings, and other functions.



Connection settings menu

**WIFI settings:** Click on the right  icon, turn on or off, turn on to select the nearby WLAN network.

**Bluetooth settings:** Click on the right  icon, turn on or off. After turning on, you can choose to scan nearby Bluetooth devices.

**Hotspot settings:** Click on the right  icon, open or close, after opening, you can set the network name of the hotspot and the password of the hotspot.

**USB Settings:** You can select either the raw data transfer mode or the file transfer mode.

**Wireless projection setting:** Connect the instrument and the monitor (TV) to the same WiFi or mobile phone hotspot, which can be projected to the monitor wirelessly.

#### 4.9.7 System settings

In the system setting menu, there are functions such as language setting, unit setting, time and date setting, custom key setting, power saving mode setting, eyepiece switching mode setting, focusing,

restoring factory settings, system information, etc.



System setup menu

**Language settings:** Simplified Chinese, Traditional Chinese, English and other languages to choose from.

**Unit setting:** optional distance unit: meter (m), foot (ft), temperature unit: Celsius (°C), Fahrenheit (°F), Kelvin (K).

**Time and date setting:** time and date format can be selected, and time and date can be selected through touch screen.

**Customized key settings:** function, back, trigger keys can be customized to take a picture, zoom in, zoom out, focus forward, focus backward, and color code switching.

**Power saving mode setting:** automatic screen off time, automatic shutdown time, LCD brightness adjustment, power saving mode, etc. can be set through touch screen selection.

**Focus:** Select screen focus or laser focus.

**Restore factory settings:** Select OK to restore to the factory settings; select Cancel to return to the existing settings.

**System information:** the model, equipment number, software version number, MAC address and other information can be viewed.

## 5 Countermeasures for Common Faults

If you experience problems with the camera, use the table below to troubleshoot. If the problem cannot be solved, please disconnect the power supply and contact the maintenance department of our company.

Fault symptom	Causes and solutions
The camera will not boot	<ul style="list-style-type: none"><li>● The battery is not installed or installed incorrectly. → Insert or reinstall the battery.</li><li>● Battery power is depleted. → Replace the battery.</li></ul>
The camera shuts down automatically	<ul style="list-style-type: none"><li>● Battery power is depleted. → Replace the battery.</li><li>● The power-off time is set in the display settings. → Select "None" here.</li></ul>
Battery power drain too fast	<ul style="list-style-type: none"><li>● Ambient temperature is too low.</li><li>● The rechargeable battery is not fully charged. → Recharge the rechargeable battery.</li><li>● The rechargeable battery is completely drained and cannot be recharged. → Replace with a new rechargeable battery.</li></ul>
No thermal image	<ul style="list-style-type: none"><li>● The lens cap is not open. → Open the lens cap.</li><li>● In the frozen image state. → Press the exit key to return to the real-time temperature measurement status.</li></ul>
The thermal image becomes black and white.	<ul style="list-style-type: none"><li>● The black and white color scale is selected. → Select the normal color scale.</li></ul>

# Appendix A

## Emissivity of common materials(For reference only)

Name of material	Surface condition	Temperature	Emissivity ( $\epsilon$ )
Aluminium	Non-oxidizing	100	0.20
	Oxidation	100	0.55
Brass	Polished brown	20	0.40
	Matte	38	0.22
	Oxidation	100	0.61
Copper	Severe oxidation	20	0.78
Iron	Oxidation	100	0.74
	Rust	25	0.65
Cast iron	Oxidized	200	0.64
	Not oxidized	100	0.21
Wrought iron	Furry	25	0.94
	Polished	38	0.28
Nickel	Oxidized	200	0.37
Stainless steel	Oxidation	60	0.85
Steel	Oxidation at 800 °C	200	0.79
General brick	Surface	20	0.93
Concrete	Surface	20	0.92
Glass	Polished plate	20	0.94
Lacquer	White	100	0.92
	Natural color black	100	0.97
Carbon	Smoke black	25	0.95
	Candle smoke	20	0.95
	Rough surface of graphite	20	0.98
Paint	Average of 16 colors	100	0.94
Paper	White	20	0.93
Sandy soil	Surface	20	0.90
Wood	Shaving	20	0.90
Water	Distilled water	20	0.96
Skin	Human beings	32	0.98
Ceramics	Fine	21	0.90
	Thick	21	0.93

# Appendix B

## Table of factory setting parameters

**Table 1 Temperature measurement setting parameter table**

Parameter	Parameter value
Gear	-40 ~ 150°C
Double Lens	Standard
Unit of temperature	°C
Reference temperature measurement	Off
Reference temperature	30°C

**Table 2 Temperature measurement correction parameter table**

Parameter	Parameter value
Specific Radiation Coefficient	0.96
Corrected temperature	0°C
Background temperature	Off

**Table 3 Table of analysis setting parameters**

Parameter	Parameter value
Temperature alarm	Off
Alarm temperature	50.0°C
Alarm color	None
Isothermal color	Off
Isothermal upper limit	51°C
Isothermal lower limit	49°C

**Table 4 System Setting Parameters**

Parameter table	Parameter value
Language selection	Chinese
Automatic correction	60S
LCD brightness	60%
Video format	
Time to turn off the display	0 points
Power off time	0 points

## FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To assure continued compliance, any changes or modifications not expressly approved by the party. Responsible for compliance could void the user's authority to operate this equipment. (Example- use only shielded interface cables when connecting to computer or peripheral devices).

This equipment complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The SAR limit adopted by USA and Canada is 1.6 watts/kilogram (W/kg) averaged over one gram of tissue. The highest SAR value reported to the Federal Communications Commission (FCC) the Industry Canada (IC) for this device type

when it is tested for the properly worn on the body is under 1g 1.6W/Kg.

The device complies with the RF specifications when the device is used near you at a distance of 0 mm from your body. Ensure that the device accessories such as a device case and a device holster are not composed of metal components.

This device was tested for typical body-worn operations. To comply with RF exposure requirements, a minimum separation distance of 0 mm must be maintained between the user's body and the product, including the antenna. Third-party belt-clips, holsters, and similar accessories used by this device should not contain any metallic components. Body-worn accessories that do not meet these requirements may not comply with RF exposure requirements and should be avoided. Use only the supplied or an approved antenna.