



Handheld Professional Thermal Camera

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1. Product Introduction

1.1. Product Description

DYT HandHeld Professional Thermal Camera DP-38/DP-64 is a new generation of handheld thermal imaging product integrating visible light and infrared light, with built-in high sensitivity infrared detector and high resolution visual camera, which can sense the ambient temperature changes quickly and accurately measure the temperature of high temperature targets in the environment. Combined with dual-light fusion, picture-in-picture and other image processing technologies, thermal imaging and visible image fusion overlay can be realized to help field personnel quickly troubleshoot faults, assist decision-making and ensure safety.

DYT Hand-Held Professional Thermal Camera breaks the traditional on-line static temperature measurement mode and makes infrared temperature measurement more convenient. The device adopts 4.3-inch high-light LCD touch screen, equipped with 640 ×480 infrared detector and industrial grade 5 million pixel visual camera; Add points, lines, rectangles and other temperature measurement objects; Support real-time interactive temperature width dynamic adjustment mode, combined with self-developed digital detail enhancement algorithm, make temperature measurement work more professional and credible; Support temperature abnormal alarm, automatically determine the temperature abnormal value and screen prompt and sound alarm; Support USB connection, can realize real-time picture capture and record, and capture/record files add corresponding text/voice remarks, can also export and analyze offline data. The overall appearance design of the thermal camera conforms to the ergonomic design, and can be widely used in metallurgy, electric power, coal mine, medical treatment, construction,

scientific research, fire and other fields.

1.2. Product Appearance

DYT Handheld Professional Thermal Camera adopts 4.3-inch high-light LCD touch screen, front fill light hole, laser hole, visible lens hole, infrared lens hole, tripod fulcrum, trigger, battery; Rear on-off button, direction keyboard, baffle zero calibration button, laser button, return button, lens cover, charging indicator hole, speaker hole, microphone hole, and LCD screen. The product appearance of hand-held professional thermal camera is shown in Figure 1.1.



Figure 1.1 Product Appearance

1.3. Product Size

The product size of **DYT Handheld Professional Thermal Camera** is 275*123*130mm, as shown in Figure 1.2.

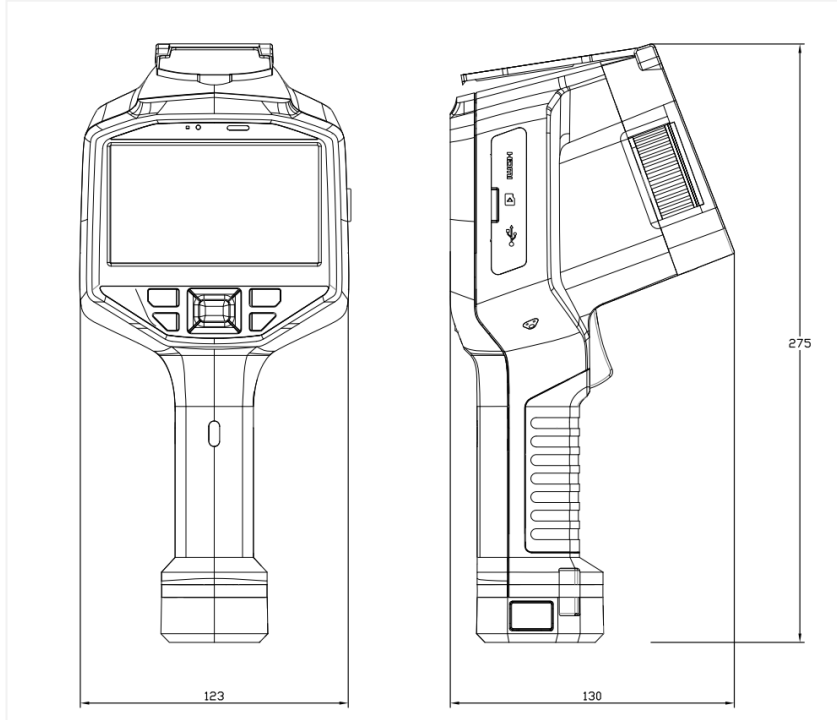


Figure 1.2 Product Size Diagram (Unit: mm)

2. Configuration List

The list for standard configuration is below.

Table 2.1 List of Materials for Standard Configuration

Materials	Quantity	Remarks	Physical Pictures
Handheld thermal camera	1	Including 1 battery	
Card Reader	1	UGREEN USB 3.0 dual card with dual read	
TF card	1	32G	
Qualification Certificate	1	/	
Warranty card	1	/	
Power adapter +USB cable	1	UGREEN qc 3.0 charger 18W quick charge with 1 meter Type-C data cable	

Battery holder	1	1 battery + 1 battery base	
Charging base	1	/	
Wrist strap	1	/	
Packing box	1	10.2 inch, inner box size 390*270*155mm	
EVA Inner Village	1	/	
EVA lining	1	/	

3. Button & Interface

3.1. Front Buttons

DYT Handheld Professional Thermal Camera contains the front fill light hole, laser hole, visual camera lens hole, infrared lens hole, tripod fulcrum, trigger, battery and other key/display holes. The front structure of the device is shown in Figure 3.1.

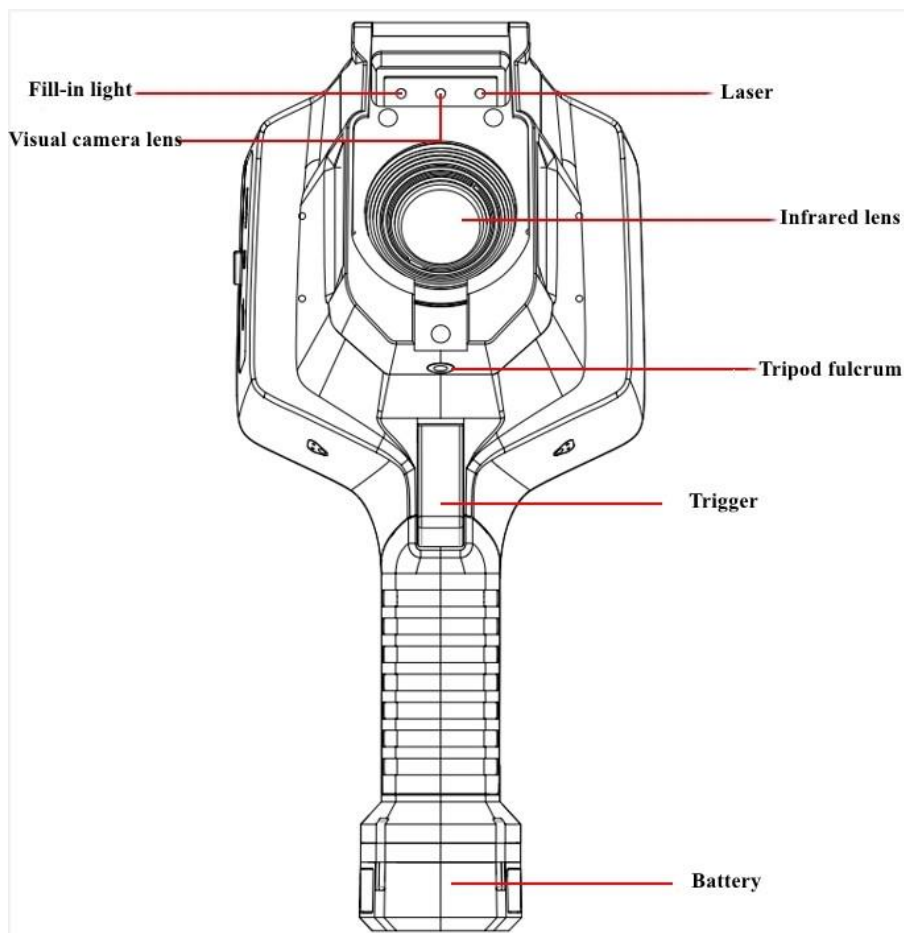


Figure 3.1 Front Structure Diagram

Table 3.1 lists the names and uses of the front buttons/display holes.

Table 3.1 Names & Functions of Front Buttons & Holes

Name	Description of Use
Fill light	Go to "Settings" > "Device Settings" or use the physical button "Up" to turn on/off the fill light
Laser	Press the "Laser" button to turn on/off the laser
Visual camera lens	Used to obtain visual camera images
Infrared lens	Used to acquire infrared images
Tripod	Used to install tripod in static usage scenarios
Trigger	Used for capturing/recording pictures
Battery	Used to power the thermal camera

3.2. Rear Buttons

The Rear of DYT Handheld Professional Thermal Camera contains switch button, direction keyboard, baffle zero setting button, laser button, back button, lens cover, charging indicator hole, speaker hole, microphone hole, LCD screen and other buttons/display holes. The rear structure of the device is shown in Figure 3.2.

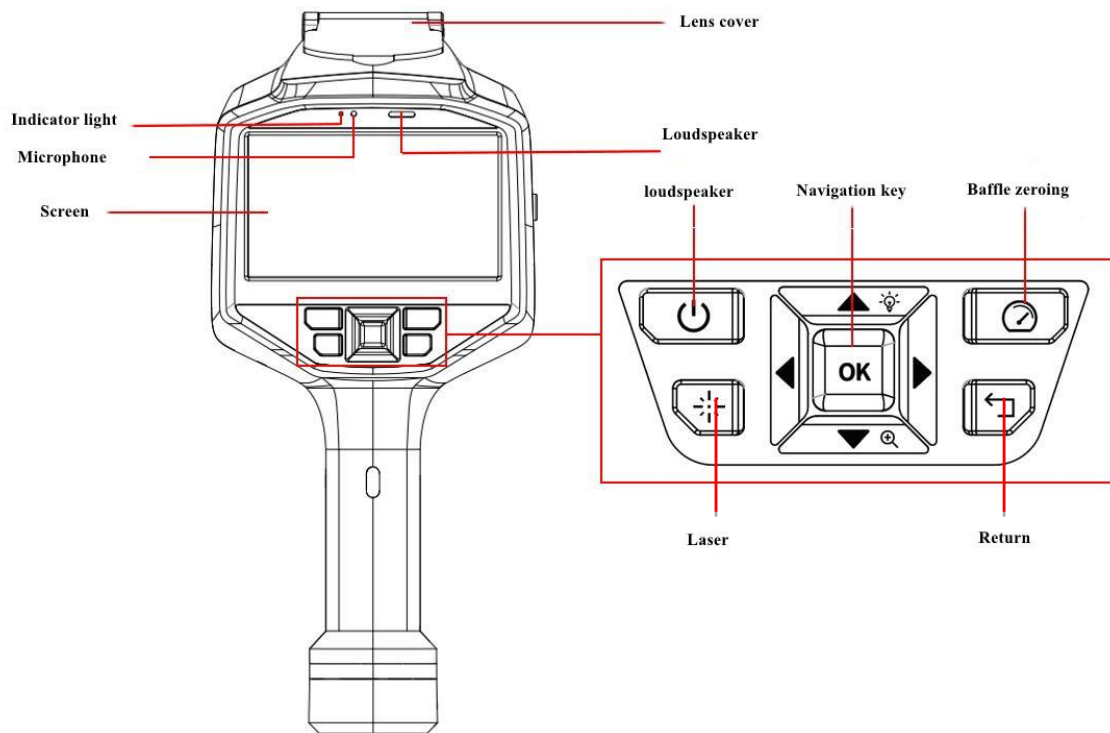


Figure 3.2 Rear Structure Diagram

The names and uses of rear keys/holes are shown in Table 3.2.

Table 3.2 Names and Uses of Rear Keys/Holes

Name	Description of Use
Switching Device	To turn the thermal camera on/off
Directional Keys	To control the movement and confirmation of the selected position on the interface
Baffle Zeroing	For zeroing of infrared lens baffle of thermal camera
Laser	For laser indication and ranging
Return	User thermal camera interface returns to upper level
Lens Cover	To protect lens and prevent lens damage

Charging Indicator Light	It switches between red and blue depending on the battery level
Loudspeaker	For audio playback
Microphone	For audio recording
Screen	4.3 "LCD screen, excellent imaging and touch

3.3. Peripheral Interface

DYT Hand-Held Professional Thermal Camera has three external ports: HDMI, SD card and USB. Figure 3.3 shows the positions of peripheral interfaces.

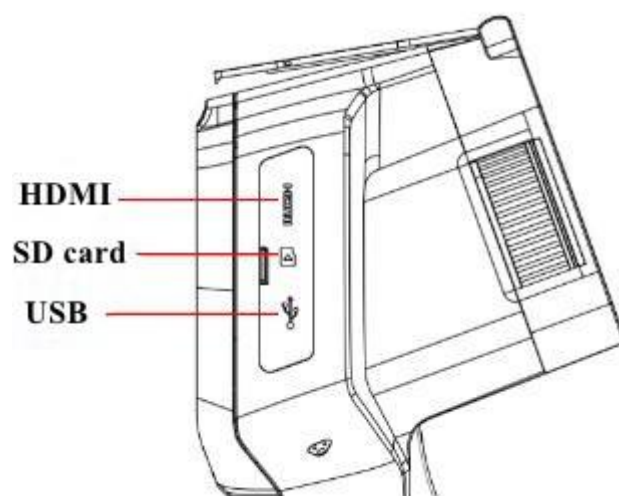


Figure 3.3 Peripheral Interfaces

Table 3.3 shows the corresponding names and uses of peripheral interfaces.

Table 3.3 Peripheral Interface Names and Usage Description

Name	Description of Use
HDMI	Used for Mini-HDMI connection

SD card	Micro SD card (namely TF card)
USB	Insert or remove a USB Type-C cable

4. Basic Operations

4.1. Device Description

(1) Charging Base

- Press both sides of the battery and separate the battery outwards;
- Put the separated battery into the charging base;
- Connect the adaptive charger of the charging base to start charging (see Figure 4.1).

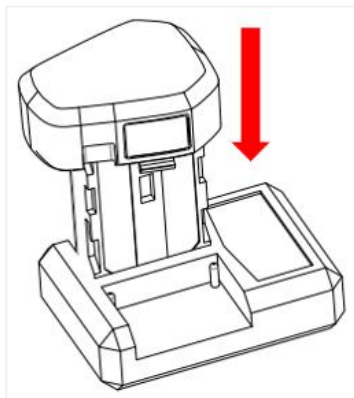


Figure 4.1 Charging by Charging Base

△ Note: charging base equipped with charging indicator light, it can be finished according to the color of the charge indicator to determine whether it charged.

(2) USB cable

- Unfractionated battery, connect the USB cable with infrared thermal camera on the

side of the USB interface;

- Connection appropriate power adapter or a computer, you can start charging.

△ Note: observation of the user interface when charging the battery indicator to judge the current into power.

(3) Switching device

- Correctly install the battery of the thermal camera. When the battery power is sufficient, open the protective cover behind the lens and long press the on/off button above the device for 3s to start the device. Observation can be carried out after the device module is loaded.
- When the thermal camera is on, long press the On / Off button on the upper part of the device for 3s to shut down the device.

(4) Wrist strap installation

- Wrist band installation location, as shown in the figure will respectively installed on both sides of wrist strap on this location (as shown in figure 4.2).

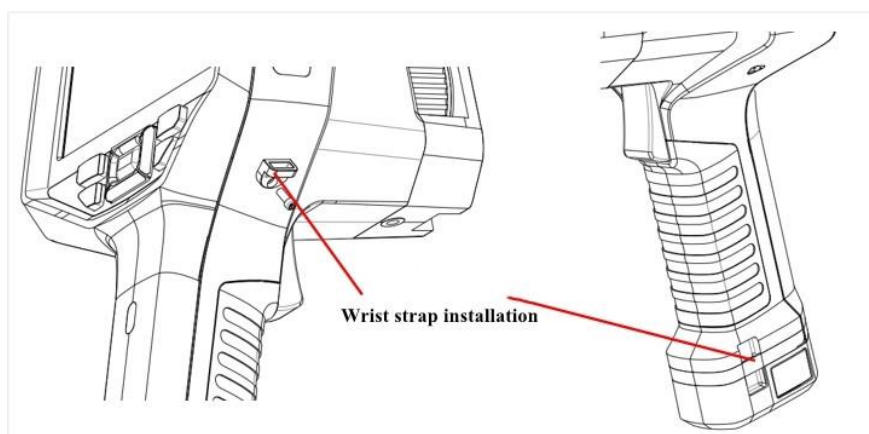


Figure 4.2 Wrist strap installation diagram

(5) Focus

- The thermal camera is powered on;
- Point the lens of the thermal camera at the target scene to be observed;
- Adjust the focusing wheel beside the lens clockwise or counterclockwise to observe the changes of the image of the thermal camera and adjust it to the appropriate focal length.

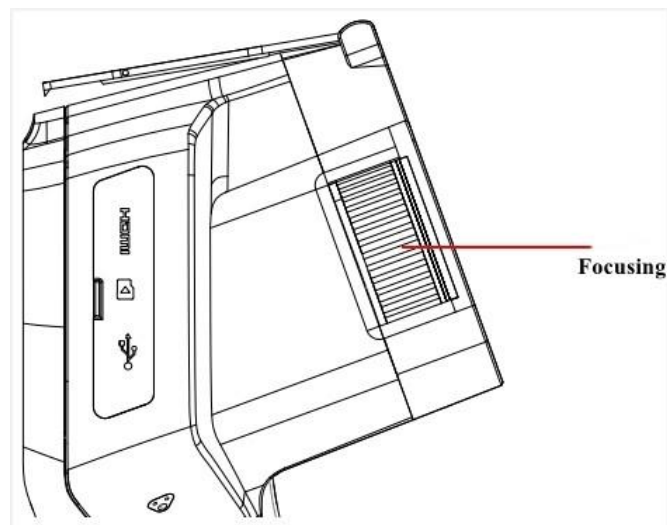


Figure 4.3 Diagram of focusing

△ Note: please put the thermal camera to adjust to the correct focal length, the observation and measurement of target scene again, otherwise it may affect imaging effect or the accuracy of measurement.

(6) Shoot

1) Snap photos

- In the observation interface, adjust the screen to the required state and press the trigger button to enter the capture mode. To save the captured image, touch and click

Save or press the physical "OK" key.

2) Video recording

- In the observation interface, adjust the screen to the required state, long press the trigger button to enter the recording mode, the shooting timing is displayed on the upper right of the screen, and short press the trigger button again to stop recording. After stopping the recording, touch and click Save or press the physical "OK" key to save the current recording.

(7) File storage and transfer

1) SD card

- Open the peripheral interface cover on the side of the thermal camera;
- Take out the SD card on the side of the thermal camera;
- With the card reader to achieve file export.

2) Type-C

- Open the peripheral interface cover on the side of the thermal camera;
- Connect the thermal camera to the computer using a USB cable. Observe whether the USB icon appears in the status bar on the left side of the user interface.
- The computer side recognizes the connected disk, enters the corresponding folder, can view or copy the video file and capture the picture file;
- After the operation is complete, disconnect the USB cable from the computer.

4.2. Functions and Features

DYT Hand-Held Professional Thermal Camera featured global cutting-edge hardware, comprehensively innovated temperature image algorithm, combined with breakthrough production technology and manufacturing process, challenging extremely harsh environment with core, precision, clarity, stability, portability and durability, with the following functions and features:

- 1) **Real-time preview:** Support real-time preview of monitoring scene images, what you see is what you get.
- 2) **Temperature measurement:** real-time collection of infrared temperature data, supporting the addition of specific temperature measurement objects for temperature measurement.
- 3) **Dynamic adjustment of temperature width:** real-time interactive dynamic adjustment mode of temperature width with professional algorithms, temperature changes at a glance.
- 4) **Picture capture/record:** can quickly capture the screenshot of the current picture or record the video of the current picture.
- 5) **Dual-band fusion:** it can realize the fusion of infrared picture and visible picture, with excellent fusion effect.
- 6) **Temperature labeling:** According to the temperature changes in the monitoring scene, the temperature exceeding the threshold can be labeled with high difference colors.
- 7) **Global maximum temperature sound alarm:** real-time monitoring of global

maximum temperature can realize high temperature alarm, low temperature alarm and interval temperature alarm.

8) Color palette switching: 6 kinds of color palette switching are supported to make the observed scene temperature more real and visible.

9) Digital doubling: 1-8x digital doubling function can be realized.

4.3. Operation Guide

(1) Main menu introduction

After the thermal camera is powered on normally, the real-time observation interface is entered. The main menu of the product is shown in Figure 4.4.

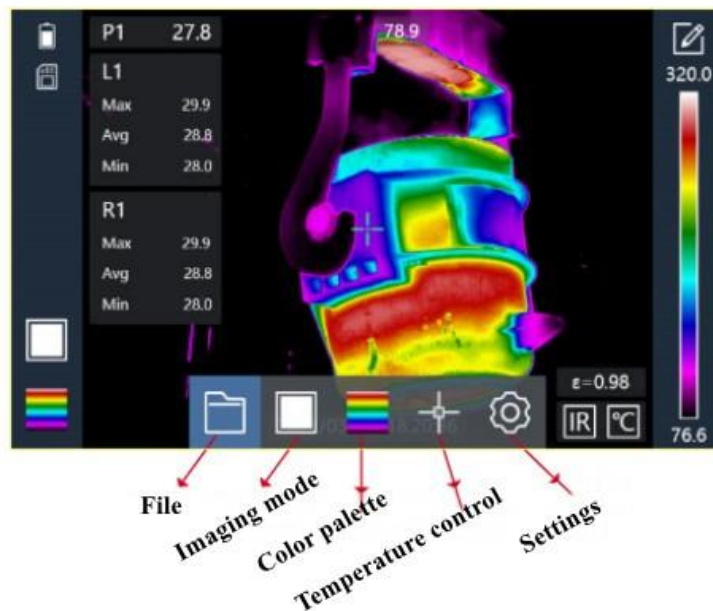


Figure 4.4 Main menu interface

File: used to view single or multi-frame data captured/shot;

Imaging mode: used to switch the picture to infrared, visible light, dual band fusion, picture in picture;



Color palette: For switching color palettes or using temperature markers;

Temperature measurement and control: for adding and deleting temperature objects;

Settings: Used to modify device imaging and temperature measurement parameters.

(2) Dynamic adjustment of temperature width

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or press a physical button to switch to , press the physical "OK" key or touch click , to enter the Settings screen;

Step 3: Touch or press the physical button to switch to "Image Settings", and press the physical "OK" button to enter the image setting interface (Figure 4.5), and adjust the gain level (PHE: plateau histogram equalization algorithm (PHE), algorithm type).

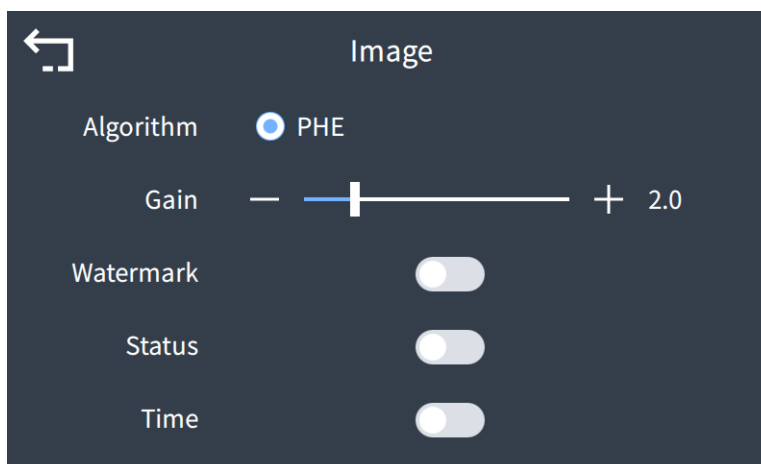



Figure 4.5 Image Settings

Step 4: Return to the real-time screen, touch and click  above the temperature width, can enter the dynamic adjustment mode of temperature width (see Figure 4.6);

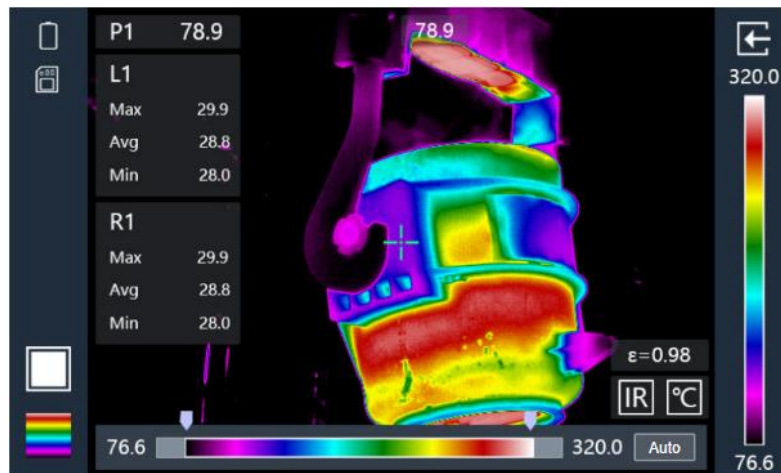




Figure 4.6 Dynamic adjustment mode of temperature width

Step 5: After entering the dynamic adjustment mode of temperature width, the temperature width adjustment bar appears at the bottom of the screen. There are three adjustment modes:

- 1) Touch and click the button  on the left of the temperature width adjustment bar and drag to dynamically change the low temperature level. Observe the screen, the temperature areas below the low temperature level are shown as the lowest temperature color in the temperature width distribution bar;
- 2) Touch and click the button  on the right of the temperature width adjustment bar and drag to dynamically change the high temperature level. Observe the screen, the temperature areas above the high temperature level are shown as the highest temperature color in the temperature width distribution bar;

3) Touch and click the button **Auto**. After adjustment, the low temperature level and high temperature level will be automatically restored to the highest and lowest temperature value of the current screen.

(3) Add temperature measurement objects

For temperature measurement objects you can add a global maximum of eight local temperature measurement objects. There are three types of local temperature measurement objects: point, line, and surface. To add, delete, or modify the temperature measurement object, follow the following steps:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or click the physical button to switch to the fourth function icon from the left of the main menu, and press the physical "OK" key to call up the temperature menu (as shown in Figure 4.6);

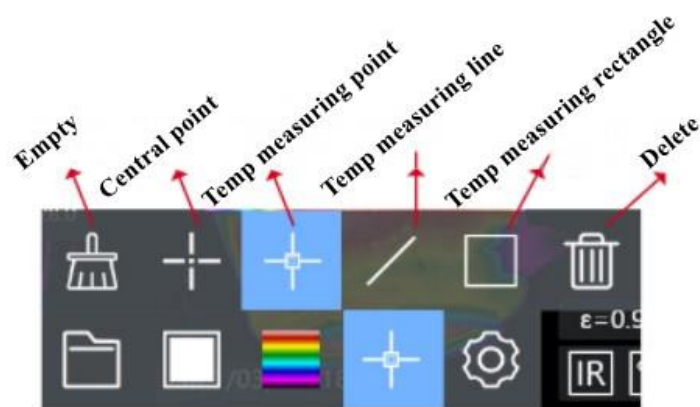


Figure 4.6 Temperature measurement object

Step 3: Touch or press the physical button to switch to the corresponding icon of the temperature measurement object in the temperature measurement menu. Press the physical "OK" key to enter the state of adding the temperature measurement object.

△ Note: available in the center of this interface to click to show or hide the center and the center temperature value; If you add a temperature object successfully, you can touch it again to modify its position, direction, or size.

(4) Imaging mode switching



There are four imaging modes: infrared mode, visible light mode, two-band fusion mode and picture-in-picture mode. The steps to switch imaging mode are as follows:



Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;



Step 2: Touch or click the physical button to switch to the second function icon from the left of the main menu, and press the physical "OK" key to call up the imaging mode menu (as shown in Figure 4.7);





Figure 4.7 Temperature measurement object

1) Touch and click  or switch the physical button to , press the physical "OK" key to switch to the infrared screen.

2) Touch and click  or switch the physical button to , press the physical "OK" button to switch to the visible light picture.

3) Touch and click  or switch the physical button to , press the physical "OK" key to switch to the dual band fusion screen.

4) Touch and click  or switch the physical button to , press the physical "OK" key to switch to picture in picture.

△ Note: dual band combination interface can be adjusted by adjusting the lens and the distance of the object visible light image and infrared image of coincidence degree, also can adjust the infrared images and visible images fusion ratio; In the picture-in-picture interface, the coincidence degree of visible and infrared images can be adjusted only by adjusting the distance between lens and object.

(5) Color palette switch

There are six color palettes available for switching: black hot, white hot, iron red, high contrast, Red Saturated and Jet. The steps to switch the color palette are as follows:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or click the physical button to switch to the third function icon from the left of the main menu and press the physical "OK" key to call up the fake color menu (as shown in Figure 4.8);



Figure 4.8 Color Palette switching

Step 3: Touch or physical keys to switch to any palette, and press the physical "OK" key to switch the palette.

(6) Temperature mark



Four temperature marking modes are provided for marking abnormal color of the picture: high temperature marking, low temperature marking, in-interval marking and out-of-interval marking. The steps for setting the temperature marking of the picture are as follows:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or click the physical button to switch to the third function icon from the left of the main menu. Press the physical "OK" button to call up the fake color menu (as shown in Figure 4.9);



Figure 4.9 Temperature mark

Step 3: Touch and click  or switch the physical button to , press the physical "OK" key to open the temperature threshold filling interface (as shown in Figure 4.10);

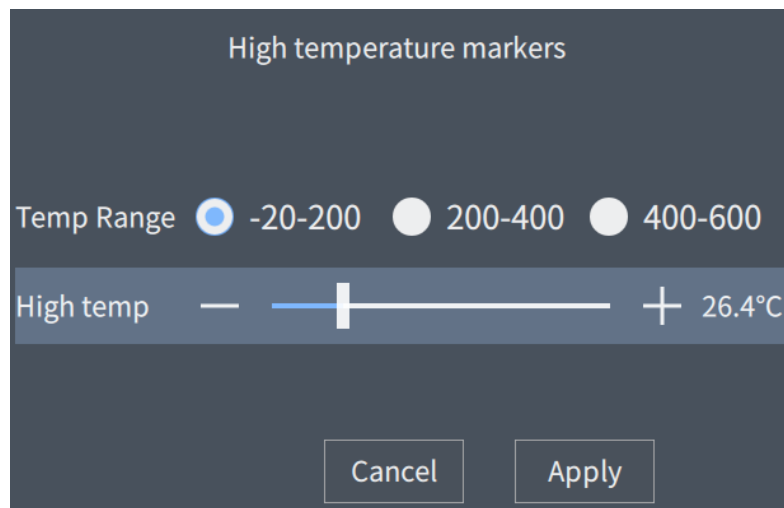



Figure 4.10 Setting the temperature value

Step 4: Touch or physical button to switch to "Apply", press the physical "OK" key, or touch and tap "Apply" to apply the mark temperature threshold set in the current mark mode.

(7) Global alarm

Three alarm rules are provided to monitor the global abnormal state of the highest temperature in real time: high temperature alarm, low temperature alarm, interval temperature alarm.

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or press a physical button to switch to , Press the physical "OK" key to enter the setting interface (as shown in Figure 4.11);

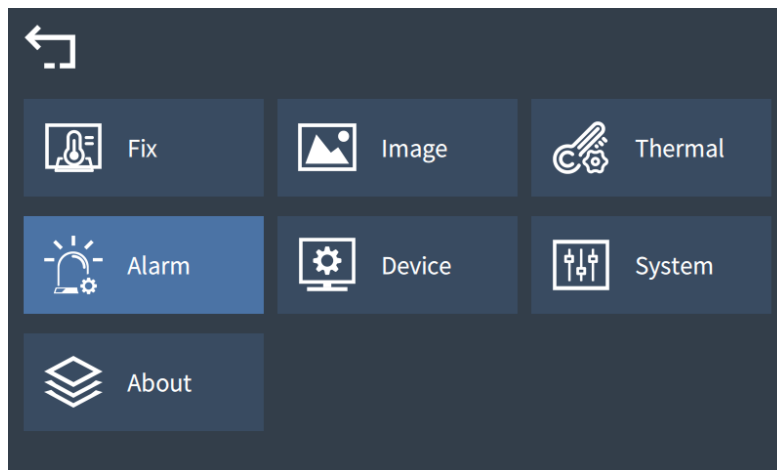


Figure 4.11 Setting interface

Step 3: Touch or click the physical button to switch to "Alarm Setting" and press the physical "OK" button to enter the alarm setting interface (as shown in Figure 4.12);

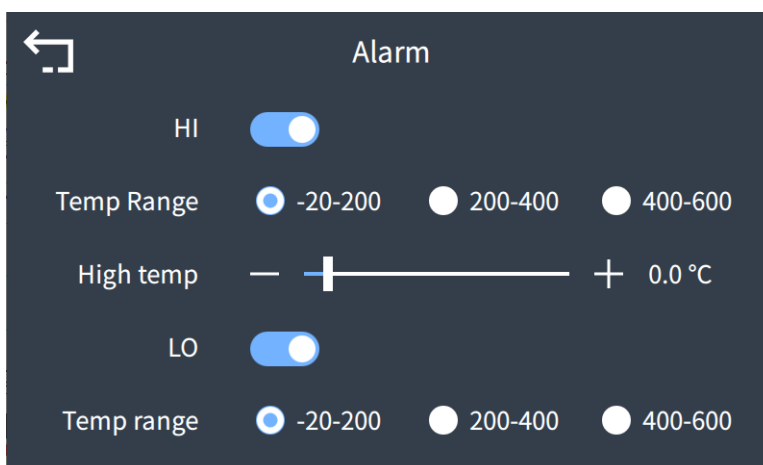



Figure 4.12 Alarm Settings

Step 4: Touch or press a physical button to turn on the high temperature alarm switch, select the threshold range, and modify the high temperature threshold parameter.

(8) Capture and video

Capture picture is divided into two modes, namely single shot mode and continuous shot mode. Press the trigger button in the single shot mode, and the picture will be paused to enter the single shot state; Press the trigger button in continuous shooting mode, and the device will automatically capture the shot according to the number of consecutive shots and shooting interval set in advance. The steps for setting the shooting mode are as follows:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK", to call up the main menu;

Step 2: Touch or press a physical button to switch to , press the physical "OK" key to enter the setting screen.

Step 3: Touch or press the physical button to switch to "System Settings" and press the physical "OK" button to enter the system Settings interface (as shown in Figure 4.13);

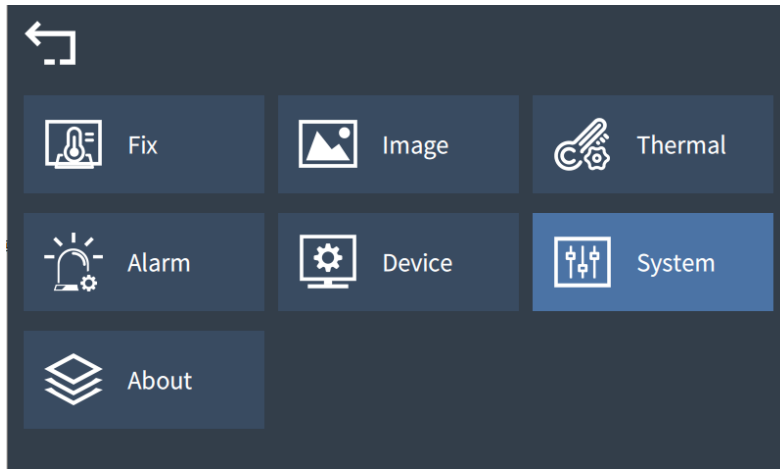


Figure 4.13 Alarm Settings

Step 4: Touch and click the photo mode to enter the photo mode selection page (as shown in Figure 4.14);

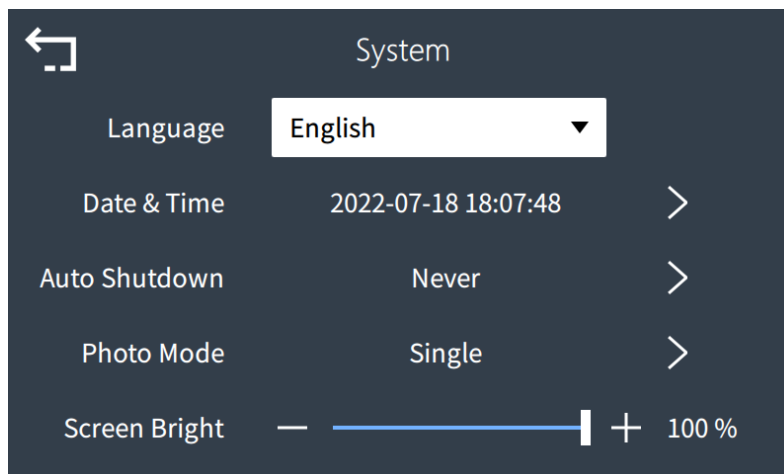


Figure 4.14 Photo Mode

Step 5: There are two optional photo modes: single photo and continuous photo. For continuous photo, the number and interval of photos should be set (as shown in Figure 4.15).

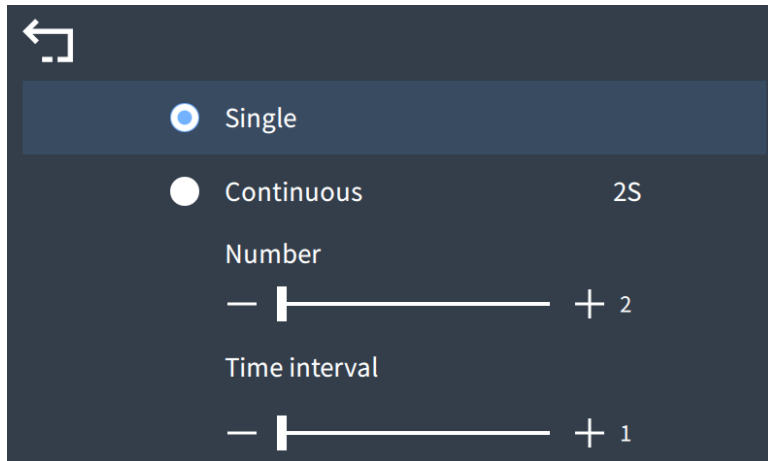


Figure 4.15 Photo Mode Settings

Step 6: After the setting is complete, touch the trigger once to enter the capture state, and long press the trigger to enter the recording mode (as shown in Figure 4.16). Text (T): can add text remarks to a captured image. Voice (🎤) : can add voice notes to captured images. Save (💾) : make sure to save the current snapshot and its remarks; Delete (🗑️) : delete the current snapshot and its remarks.

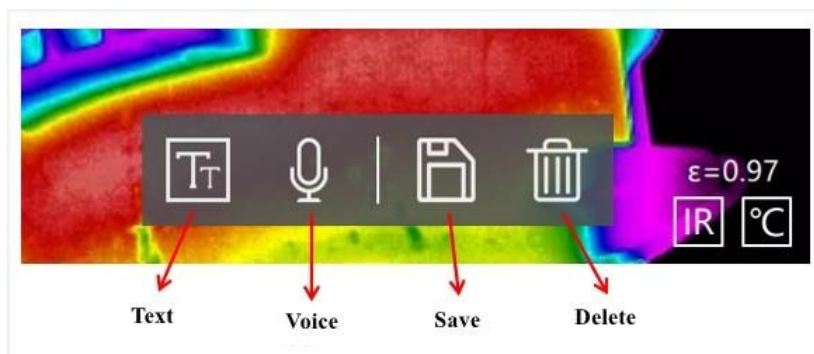


Figure 4.16 Capture Settings

(9) File viewing and editing

Step 1: Touch and click the blank area of the screen in the user interface or press the

physical button "OK" to call up the main menu;

Step 2: Touch or press the physical button to switch to, and press the physical "OK" key to enter the interface for viewing files. Files are stored in folders named after the date of shooting (as shown in Figure 4.17). Click "Folder" to view the files shot/recorded on the corresponding date.

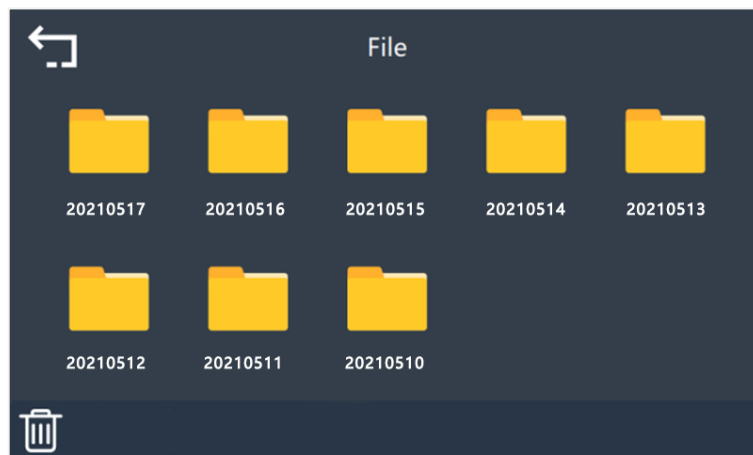



Figure 4.17 Folder Display

(10) Digital multiplication

When the real-time monitoring interface is normally entered, the digital doubling interface can be entered by using physical arrow keys  (as shown in FIG. 4.18). The scale can be changed by touching the sliding slider or the left and right physical keys.

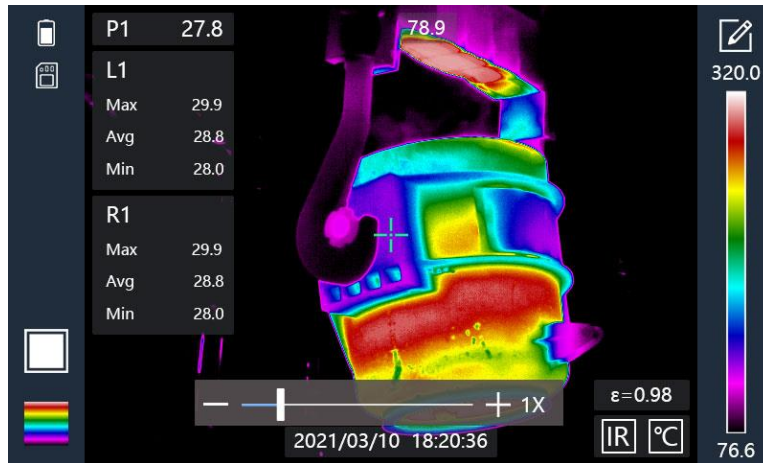



Figure 4.18 Digits Multiplication

(11) Temperature correction

If the temperature needs to be corrected, you can go to the temperature correction interface to set the temperature. The steps are as follows:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or press the physical button to switch to , and press the physical "OK" key to enter the setting interface;

Step 3: Touch or press the physical button to switch to "Temperature Correction" and press the physical "OK" button to enter the temperature correction interface (as shown in Figure 4.19).

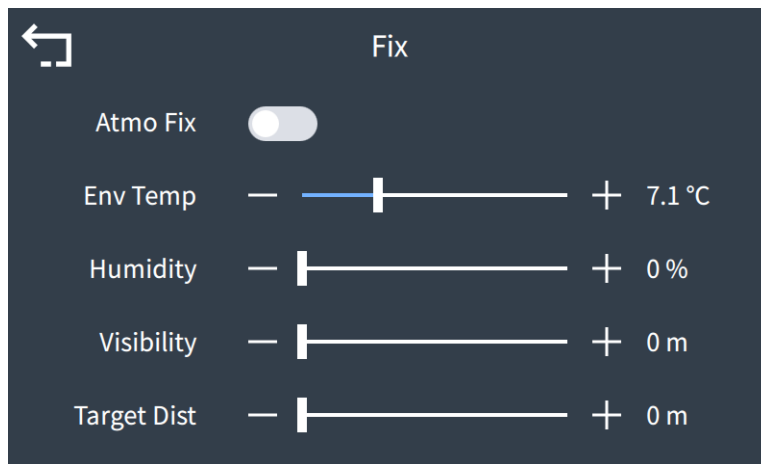



Figure 4.19 Temperature correction

△ Note: the temperature calibration interface for atmospheric correction, ambient temperature, relative humidity and visibility, target distance, adjust the corresponding global emissivity, temperature drift, ensure the precision of measurement.

(12) Temperature measurement configuration (temperature range, temperature unit, etc.)

If you need to adjust the measuring temperature unit, temperature range, temperature label, etc., you can go to the temperature setting interface to set. The steps are as follows:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or press the physical button to switch to , and press the physical "OK" key to enter the setting interface;

Step 3: Touch or press the physical button to switch to "Temperature Setting" and press the physical "OK" button to enter the temperature setting interface (as shown in Figure 4.20);

Step 4: Adjust the appropriate temperature unit, temperature range, and temperature label.

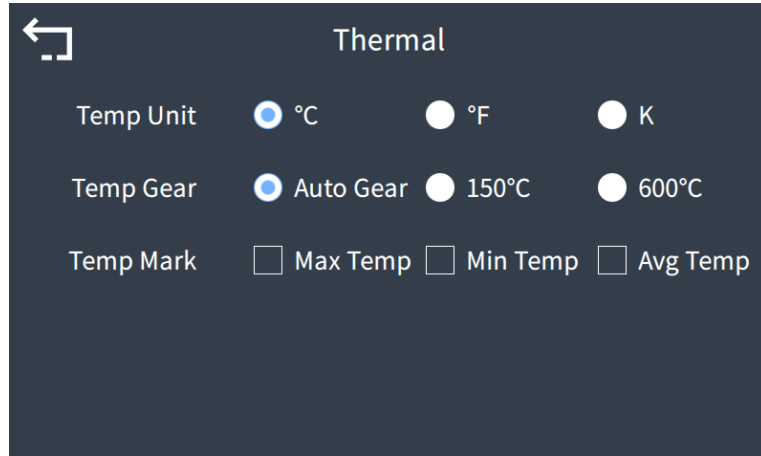



Figure 4.20 Setting of Temperature Measurement

(13) System configuration (automatic shutdown, photo mode, etc.)

If you need to adjust the language, date and time, photo mode, touch screen calibration, screen brightness, factory restoration, format SD card, etc., you can go to the system setting interface to set. The steps are as follows:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or press the physical button to switch to , and press the physical "OK" key to enter the setting interface;

Step 3: Touch or press the physical button to switch to "System Settings" and press the physical "OK" button to enter the temperature setting interface (as shown in Figure 4.21);

Step 4: Select the appropriate automatic shutdown time, photo mode, etc.

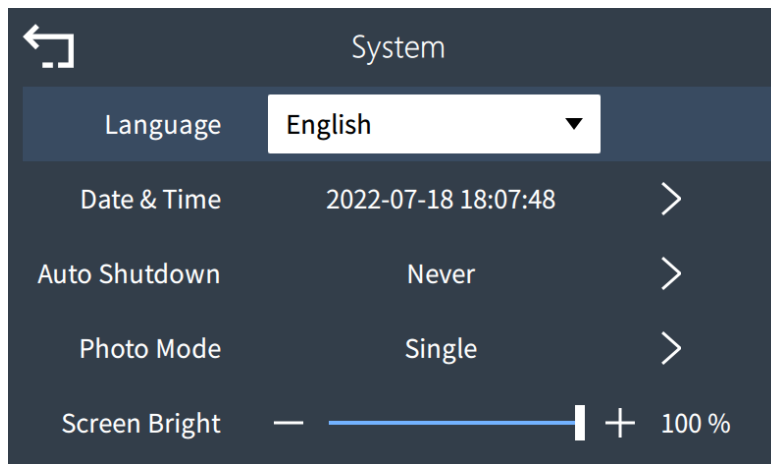



Figure 4.21 System Settings

(14) Format data and restore factory Settings

You can format the contents of the SD card on the device or restore the data to factory defaults by performing the following operations:

Step 1: Touch and click the blank area of the screen in the user interface or press the physical button "OK" to call up the main menu;

Step 2: Touch or press the physical button to switch to , and press the physical "OK" key to enter the setting interface;

Step 3: Touch or press a physical button to switch to Device Settings, and press the physical OK key to enter the device Settings screen, or touch or press a physical button to switch to Product Info, and press the physical OK key to enter the product Info screen, and choose Format Data or Restore Factory Settings.

△ Note: the formatting data can lead to empty, please use caution; After factory Settings are restored, all parameter modification states are cleared and parameters are restored to factory defaults.

5. Specification Parameters

Features/Performance	DYT DP Series	
Model Parameters		
Model	DP-38	DP-64
IR Resolution	384×288	640×480
Focal Length	15mm/F1.0	25mm/F1.0
Pixel Size	17μm	
Thermal Sensitivity/NETD	≤50mK@25°C	
Detector Type	Uncooled microbolometer	
Digital Zoom	1x-8x (integer)	
Image Frequency	30Hz	
Focus Mode	Manual focus	
Temp Measuring		
Object Temperature Range	-20°C~600°C (customizable, up to 1600°C)	
Accuracy	±2°C or ±2% take the max (ambient temp 25°C)	
Temperature Screening	Supports multiple temperature screening modes, such as high temperature, low temperature, and interval temperature	
Temperature Measurement Model	Support 1 global, 8 local (including point, line segment, rectangle), 1 central point temperature measurement, temperature monitoring accords to different areas	
Alarm Function	Customize alarm temperature thresholds to monitor temperature anomalies such as high, low, interval temperatures in real time	
Display		
Screen	4.3 "LCD capacitive touch screen	
Display Type	Highlight industrial display, visible in sunlight, capacitive touch	
Display Resolution	800*480	
Screen Display Mode	Visible light, thermal imaging, dual band fusion, picture in picture	

Image	
Imaging Technology	Independent R & D of image processing algorithm, support PHE
Dual band fusion Imaging Mode	High screen fusion precision & High degree of scene restoration
Visual Camera Pixels	500W
Color Palettes	Supports black heat, white heat, iron red, high contrast, red saturation, jet mode
Fill-in Light	Supports quick on-site light filling
Professional Functions	
Video	Supports real-time capture and video recording
Video Playback	Support file playback, storage according to time classification, easy to find
Laser Designation	Support
Data Management	
Data Storage	Supports two modes: single shot and continuous shot
Interfaces	USB Type-C, TF card, Mini-HDMI
Storage Capacity	32G
Field notes	Support to add voice (45s) and text annotation (100 words)
General Specifications	
Battery Type	Lithium-ion batteries, 7.4V 2600mAH
Battery Operating Time	Double battery 8h total, can be replaced on site
Charging type	Charging base charging or Type-C interface charging
Operating Temp Range	-10°C ~ +50°C
Protection Level	IP54
Grade of fall protection	2m
Volume	275mm×123mm×130mm
Weight	≤900g

6. Application Field

DYT Hand-Held Professional Thermal Camera is widely used in metallurgy, hazardous waste environmental protection, coal mine, medical, construction, scientific research, effective prevention and other application scenarios, can be suitable for ladle resistant material defect monitoring, power failure monitoring, etc.

Defect monitoring of ladle resistant materials: Using visual identification, infrared temperature measurement and other technologies, the temperature change of container brick lining and steel shell is comprehensively analyzed, so as to timely discover the erosion and fall off of refractory materials inside ladle, steel plate softening and even melting erosion problems and give early warning, so as to avoid ladle burning through and causing ladle penetration accidents to the maximum extent. Figure 6.1 shows the actual application scenario.

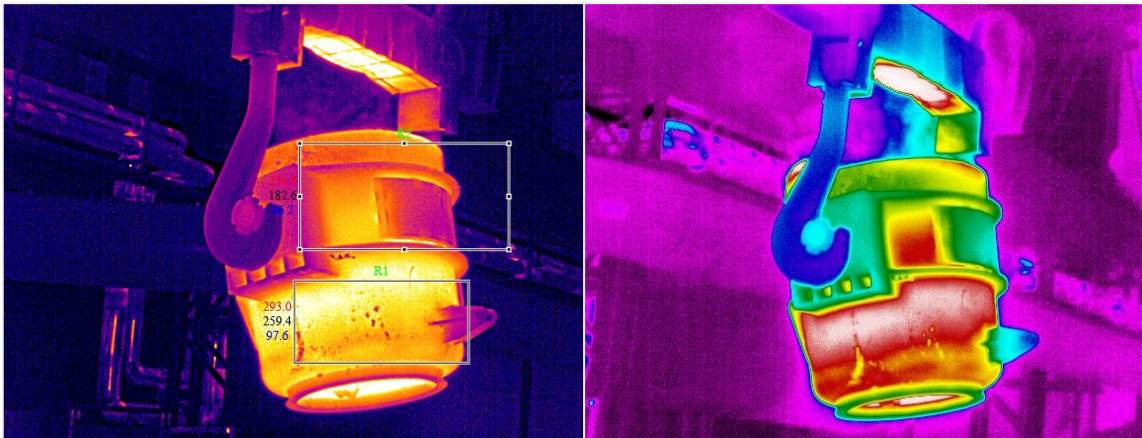


Figure 6.1 Defect Monitoring of Ladle Resistant Material

Power failure monitoring: infrared light + visible light dual-spectrum monitoring method is adopted to monitor the temperature field of the power grid through infrared

light. When abnormal temperature occurs, alarm signals are sent to remind the staff to take effective measures. Assisted by visible light monitoring, the situation within the field of view can be monitored in real time, so that the staff can see the surrounding situation of the power grid more clearly and make correct decisions. Figure 6.2 shows the actual application scenario.



Figure 6.2 Power Failure Monitoring

7. FAQs

Table 7.1 lists the common questions and answers. In case of problems that cannot be resolved, please contact the supplier.

Table 7.1 Common Questions and Answers

Q1: Can the thermal camera be charged normally?

A1: Please first ensure that the power adapter is connected properly, and then check whether the battery is properly inserted into the charging base.

Q2: Is the image of the thermal camera not clear?

A2: Try to turn the focus wheel and observe the picture until it is clear.

Q3: Can't historical files be viewed?

A3: Ensure that the SD card status is normal.

Q4: Unable to capture/record?

A4: Ensure that the SD card status is normal and the storage space is sufficient.

8. Warranty Service

1) The infrared products manufactured by DYT Infrared are entitled to one-year warranty service from the date of delivery. If there are defects in the production process or quality of the products, DYT Infrared is obligated to solve the problems of the products purchased by customers. DYT Infrared shall not be jointly and severally liable for other losses caused by the quality problems of the purchased products.

2) This warranty does not apply to any product damaged by misuse, negligence, disassembly, accident or improper operation. This warranty is non-transferable only to the original purchaser.

3) DYT Infrared can repair or replace any such defective products free of charge at its sole discretion after testing and confirming that the products are within the scope of warranty.

Appendix B Emissivity Table of Common Objects

Infrared thermometry technique is one that receives infrared radiation of the measured object through infrared detector and then converts it into video thermal image of the target by signal processing system. It transforms the thermal distribution of the object into a visual image and displays it in gray or pseudo-color on the monitor, thus obtaining the temp distribution field information of the measured object.

As the infrared thermal camera belongs to the narrow-band spectral radiation temp measurement system, the surface temp is not directly measured by it, but calculated by the measured radiant energy. Therefore, In a real scenario, the measurement accuracy is affected by the factors such as emissivity and reflectivity of the measured surface, background radiation, atmospheric attenuation, measurement distance and ambient temp.

Emissivity Values of Common Materials

Metal					
Material	Temp°F(°C)	ε–Emissivity	Material	Temp°F(°C)	ε–Emissivity
Aluminum (unoxidized)	77(25)	0.02	Wrought iron (dull color)	77(25)	0.94
Aluminum (unoxidized)	212(100)	0.03	Wrought iron (smooth)	100(38)	0.35
Aluminum (unoxidized)	932(500)	0.06	Wrought iron (polished)	100(38)	0.28
Aluminium (oxidation)	390(199)	0.11	Lead (polished)	500(260)	0.08
Aluminium (oxidation)	1110(599)	0.19	Lead (rough)	100(38)	0.43
Aluminum (Highly polished)	212(100)	0.09	Lead (oxidation)	100(38)	0.43
Aluminum (rough polished)	212(100)	0.18	Magnesium	500(260)	0.10
Aluminium	212(100)	0.09	Magnesium	1820(1000)	0.16

(commercial sheet)			oxide		
Aluminum (plain rolled sheet)	338(170)	0.04	Mercury	212(100)	0.10
Bismuth (smooth surface)	176(80)	0.34	Molybdenum	100(38)	0.06
Bismuth (non-oxidized)	77(25)	0.05	Nickel (polished)	100(38)	0.05
Bismuth (non-oxidized)	212(100)	0.06	Nickel (oxide)	500(260)	0.46
Brass (polished)	476(247)	0.03	Nickel (unoxidized)	77(25)	0.05
Brass (oxidized)	392(200)	0.61	Nickel (electrolysis)	100(38)	0.04
Brass (oxidized)	752(400)	0.60	Platinum	100(38)	0.05
Brass (matte)	68(20)	0.07	Platinum (black)	100(38)	0.93
Brass	77(25)	0.04	Platinum	1340(727)	0.14

(unoxidized)			(non-oxidized)		
Brass (unoxidized)	212(100)	0.04	Silver (polished)	212(100)	0.01
Carbon (lamp black)	77(25)	0.95	Steel (cold rolled)	212(100)	0.80
Carbon (unoxidized)	77(25)	0.81	Steel (polish)	100(38)	0.07
Carbon (filament)	500(260)	0.95	Steel (oxidized)	75(25)	0.80
Carbon (graphitized)	212(100)	0.76	Steel (non-oxidized)	212(100)	0.08
Carbon (graphitized)	572(300)	0.75	Mild steel (polished)	75(24)	0.10
Copper (cuprous oxide)	100(38)	0.87	Mild steel (smooth)	75(24)	0.12
Copper (cuprous oxide)	500(260)	0.83	Tin (non-oxidized)	77(25)	0.04
Copper (matte)	100(38)	0.22	Tin (non-oxidized)	212(100)	0.05

Copper (rough polished)	100(38)	0.07	Tinplate (smooth)	76(24)	0.05
Copper (rolled)	100(38)	0.64	Tinplate (smooth)	212(100)	0.08
Copper (rough)	100(38)	0.74	Tungsten (unoxidized)	75(25)	0.02
Gold (enamel)	212(100)	0.37	Tungsten (unoxidized)	212(100)	0.03
Iron (oxidation)	212(100)	0.74	Tungsten (aged)	100(38)	0.03
Iron (oxidation)	930(499)	0.84	Tungsten (aged)	1000(538)	0.11
Iron (unoxidized)	212(100)	0.05	Uranium oxide	1880(1027)	0.79
Iron (red rust)	77(25)	0.70	Zinc (galvanized)	100(38)	0.28
Iron (rust)	77(25)	0.65	Zinc (oxidation)	500(260)	0.11
Cast iron (oxidized)	390(199)	0.64	Zinc (polished)	100(38)	0.02
Cast iron	212(100)	0.21	Zinc	500(260)	0.03

(unoxidized)			(polished)		
Nonmetal					
Material	Temp°F(°C)	ϵ -Emissivity	Material	Temp°F(°C)	ϵ -Emissivity
Brick	68(20)	0.90	Granite	70(21)	0.45
Asbestos	68(20)	0.92	Limestone	100(38)	0.95
Plate	100(38)	0.96	Red lead	212 (100)	0.93
Cement	100(38)	0.96	Hard rubber	74 (23)	0.94
Cloth	199(93)	0.90	Grey soft rubber	76 (24)	0.86
Paper	100(38)	0.93	Sand	68 (20)	0.76
Slate	68(20)	0.97	Sandstone	100(38)	0.67
Pavement asphalt	100(38)	0.93	Sawdust	68(20)	0.75
Basalt	68(20)	0.72	Slate	68 (20)	0.69
Firebrick	1832(1000)	0.75~0.80	Silk wadded	68(20)	0.78
Grey brick	2012(1100)	0.75	Snow (fine grain)	20(-7)	0.82
Emery	1850(1010)	0.92	Snow (coarse grain)	18(-8)	0.89
Earthenware (matte)	70 (21)	0.69~0.45	Emery	392(200)	0.90

Porcelain	72 (22)	0.89-0.82	Earth's surface	100(38)	0.38
Clay	68 (20)	0.90	Black clay	68(20)	0.66
Cotton cloth	68 (20)	0.77	Acetylene	75(24)	0.97
Rigid sand	176 (80)	0.86	Camphor	75(24)	0.94
Gravel	68(20)	0.28	Candle	250(121)	0.95
Gypsum	68(20)	0.80~0.90	Coal	68(20)	0.95
Smooth ice	32(0)	0.97	Stone work	100 (38)	0.93
Rough ice	32(0)	0.98	Water	100(38)	0.95
White oil paint	200 (93)	0.94	Water glass	68(20)	0.96
Black oil paint	200 (93)	0.92	Wood	Low	0.85
Red oil paint	200 (93)	0.95	White marble	100(38)	0.95
Green oil paint	200 (93)	0.95	Cultivated field	68(20)	0.38