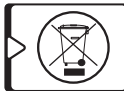




# Thermo-Vision™ Infrared Thermal imager Model No. 399

## User Manual





**EN**

Thank you for purchasing the KAPRO 399 Thermo -Vision™ Infrared Thermal imager.

This device combines an array of infrared sensors with visual light camera and produces images which represent the distribution of the objects surface temperature by color palette.

Please carefully read this user manual before you use this product for the first time.

Keep this user manual for future reference.

Always operate the device according to the instructions of this manual.



### **WARNING**

This device is a precise measurement instrument, do not dismantle, assemble, or remodel any part of it, it may damage the product and will void the warranty.

Repair of the product should be made by qualified and authorized technical personnel only.

Do not use damaged device, charger and / or cable.

Use only a standard USB charger. Do not remodel the charger and the cable, it may cause an electrical short or fire and will void the warranty.

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## CARE AND MAINTENANCE

- Avoid exposure to water and dust.
- Avoid abrupt changes of the temperature.
- Avoid dropping, vibration or shaking of the device.
- Store the device in a dry place.
- Keep the device clean.
- Clean with a damp cloth. You may use a small amount of water and soap if needed. Do not use solvents or aggressive detergents.
- Clean the lenses and the screen using the cleaning agents for professional optic or glasses.
- Compressed air can be used to remove loose particles and dust.
- Avoid damage of the lenses anti-reflection coating- gently remove the dust and loose particles before cleaning, avoid applying pressure during the cleaning of the lenses. Wipe the lenses in a circular motion with lint-free cloth and small amount of lens cleaning solution. Frequently change the cloth to avoid abrasive damage.
- In the event of a problem with the product, please return the product to the place of purchase with proof of purchase.

## BUILT-IN BATTERY CHARGING

### **Use USB data line to charge:**

The product has a built-in rechargeable 18650 lithium battery.

When the battery charge level is low, the following icon will appear at the top right of the screen: 

Charge the battery using the Micro USB interface. (You can charge when the device is off. Make sure that the cable connectors are fully inserted in the corresponding sockets. Disconnect the USB line after the battery is fully charged.

### **To make the lithium-ion battery perform perfectly:**

Do not leave the battery charging for more than 24 hours.

The thermal imaging device should be charged for two hours at least every three months to extend the battery service life to the greatest extent.

Avoid charging of the battery in an extremely cold environment.



## SPECIFICATIONS

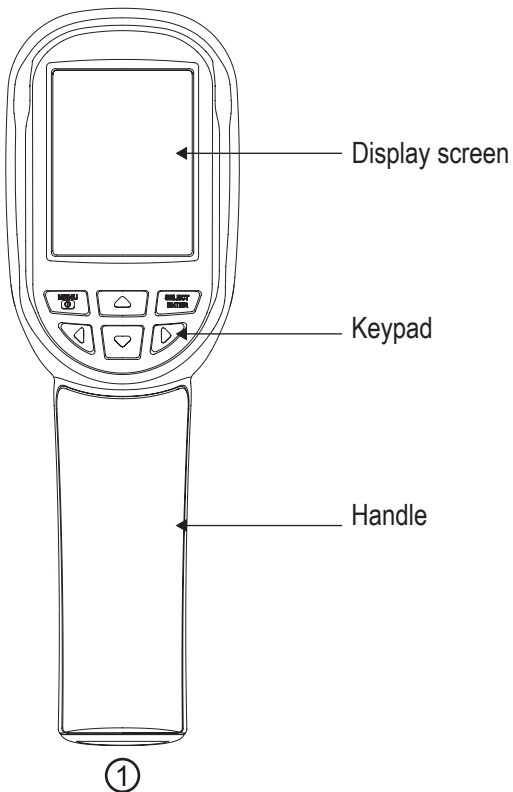
|                               |   |
|-------------------------------|---|
| Display screen                | 2.8-inch full-view TFT display  |
| Temperature measurement range | -20°C to 450°C (-4°F to 842°F)  |
| Measurement accuracy          | Up to 300°C: $\pm 2^{\circ}\text{C}$ or $\pm 2\%$ (whichever is greater)<br>Over 300°C: $\pm 5\%$ |
| Infrared image resolution     | 160×120   |
| Visible image resolution      | 300000 pixel  |
| LCD resolution                | 320×240   |
| Field angle                   | 35°×26°   |
| Shortest focus length         | 0.15m   |
| Thermal sensitivity           | 0.07°C  |
| Frame rate of thermal images  | 9Hz   |
| Focus mode                    | Fixed   |
| Wavelength coverage           | 8-14um  |
| Emissivity                    | Adjustable from 0.01 to 1.00  |

|                          |  |
|--------------------------|--|
| Color palette            | Rainbow, iron oxide red, cold color, black & white, white & black  |
| Storage capacity         | 3Gb Built-in (above 20 thousand image stored)                      |
| File format              | JPG  |
| USB                      | Micro USB 2.0  |
| Power supply             | Built-in rechargeable 18650 battery                                |
| Working time             | 2-3 hours  |
| IP                       | IP54   |
| Language                 | English, Chinese, Italian, German                                  |
| Automatic power-off time | Selectable: 5 minutes/20 minutes/<br>not powered off automatically |
| Product size             | 96mm×72mm×226mm  |
| Product weight           | 389g   |
| Work temperature         | 0°C to 45°C  |
| Storage temperature      | -20°C to 60°C  |
| Relative humidity        | < 85%RH  |



## OVERVIEW

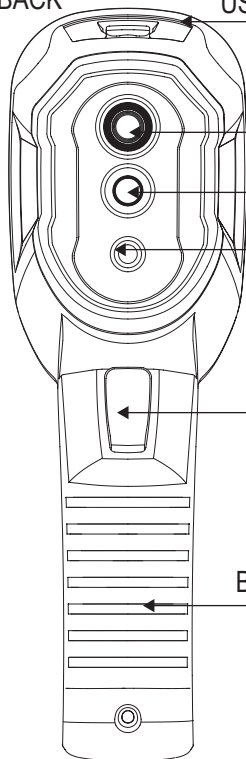
FRONT





BACK

USB protective cover / Micro USB inlet



Infrared imaging sensor

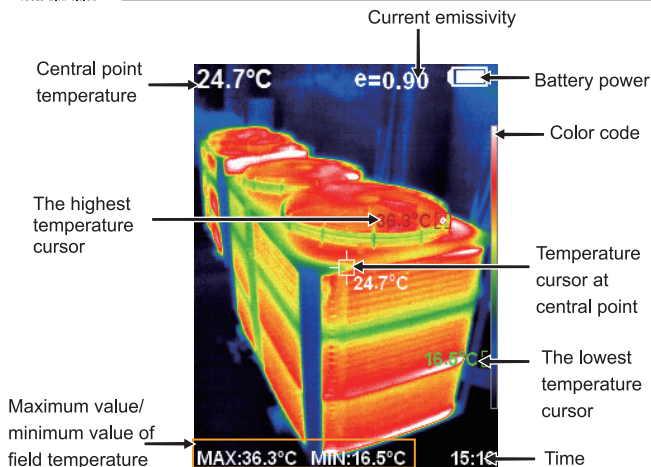
Visible light camera

LED light

Image capture key

Battery compartment (inside the handle)

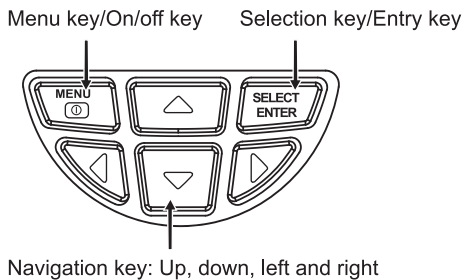
②



Temperature of the objects in the field of view are represented by colors according to the chosen Color Palette. The color on top of the color palette represents the hottest temperature, on the bottom of it – the lowest. The central point temperature cursor – white colored - indicates the center of the field of view. The temperature value is displayed by the cursor and in the top left corner of the screen. The highest temperature cursor – red colored - indicates the point with highest temperature in the current field of view. It moves with the change of the temperature. The temperature value is displayed by the cursor and in the bottom left corner of the screen.

The lowest temperature cursor - green colored - indicates the point with the lowest temperature in the current field of view. It moves with the change of the temperature. The temperature value is displayed by the cursor and in the center of the screen's bottom row.


### 3. Key description





## OPERATION INSTRUCTIONS

### **ON / OFF**

Press and hold the MENU/  button for more than 3 seconds to turn the Thermal Imager on or off.

### **LCD screen**

After turning the device on, the screen will display the field of view image. The image may be either purely thermal – product of infrared imaging sensor only, or purely visible – product of visible light camera, or fusion between them. To adjust the degree of fusion, press ◀ or ▶ key (the available degrees of fusion are: 0%, 25%, 50%, 75% and 100%), the displayed picture will be the overlapping of two images.


### **Note:**

Some time period may be required for the imager's self - adjustment if the device was moved between environments with different ambient temperatures.


### **LED light operation**

Hold down the trigger (“image capture” key) for 5 seconds to turn the LED light on or off.

## **Image capture**

Pull the trigger (image capture key) to take a picture. If the capture is successful, the screen will display “store photo?” prompt with “Yes” or “No” options. Press the MENU/  key to save the image, or press “SELECT/ENTER” key to cancel the saving.

**Show / hide** the highest/lowest temperature row at the screen bottom.

After normal start up, press the  key to show / hide the row with the highest and lowest temperature values at the bottom of the screen.

## **Transfer images**

Open the USB protective cover as shown on picture 2.  
Use a standard USB cable to connect the micro-USB port to the computer to review and /or transfer the stored images. The Thermal Imager will appear as external USB drive.  
The supporting operating systems are:  
Win XP, Win7, Win 8, Win10, Apple iOS.

### **Note:**

We recommend using the “Safely Remove Hardware and Eject Media” function on your computer when disconnecting, to avoid file system damage.



## INTRODUCTION TO THE MENU

1. Press the “MENU/ ⏻ key to show / hide the MENU bar.  
There are “image registration”, “images”, “color palette”, “emissivity” and “setting” submenus.
2. Move between submenus by pushing the ▲ and ▼ keys.
3. Enter the submenu by pushing the ► key.
4. Choose the required setting by pushing the SELECT / ENTER key, adjust number values by UP and DOWN arrow keys, confirm the change by SELECT / ENTER key.
5. Exit the submenu by pushing the ◀ key.
6. The changes will take place after exiting the MENU.



### **1. “Image registration” submenu:**

The alignment of the images from thermal and visual light cameras may be not perfect and may vary when observing the objects at different distances, since the camera is not placed at the same point. “Image registration” submenu helps to adjust the two images to exact overlap.







1. Enter the ■ (Image registration) submenu.
2. Press the “SELECT/ENTER” button to enter the image overlap adjustment mode. Press the arrow keys to shift the visible image to overlap the thermal one.
3. Press the “SELECT/ENTER” button to exit the adjustment mode (Note: If there is no operation for more than 6 seconds, the adjustment mode will be automatically exited).

## 2. “Images” submenu (functions only if the imager is not connected to the computer):

### 2.1. View saved image:

1. Press the “MENU/  button to enter the main menu, and select the  (images) in the main menu.



2. Press the  key to enter saved images list.
3. Press the  or  key to select the image.
4. Press the “SELECT/ENTER” key to view the selected image.
5. When viewing the images, press the  key to view the previous Image in the list, press  to view the next image.
6. Press the “SELECT/ENTER” key to return. Press the “MENU/  key to exit from the main menu.



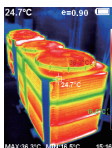
## 2.2. Deleting saved images:

When viewing the image, press the ▲ key. The screen will show the “Delete photo?” prompt. Press the “MENU/ ⏏ key to delete the image. Press the “SELECT/ENTER” key to cancel the delete.

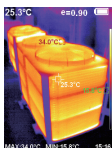
## 3. “Color Palette” sub-menu

Color palette is a set of colors used for visual representation of the different temperatures in the imager’s field of view. There are five color palettes available to suit the specific applications and personal preferences of the user: Spectra, Iron and Cool are colored palettes, White and Black represent the temperatures in shades of grey, with white or black color representing the hottest, respectively.

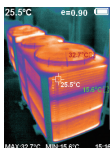
Below is the thermal image of the same object with the different color palette selected.



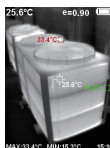
Rainbow



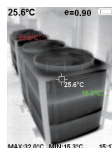
Iron oxide red



Cold color

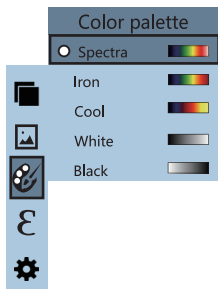







White heat



Black heat





1. Press the “MENU/ ⏻” key to enter the main menu
2. Select  (color palette) and press the  key to enter the color palettes list.
3. Press the  and  keys to select the color palette.
4. Press the “SELECT/ENTER” key to confirm the selection.
5. Press  to return. Press the “MENU/ ⏻” key to exit from the main menu.

## 4. “Emissivity” sub-menu:

### 4.1. Emissivity description

The Infrared Thermal Imager measures the amount of infrared radiation emitted by the object. This amount depends not only by the temperature of the object, but also by the properties of its material and surface finish.

Glossy, highly reflective surface or transparency of the object may distort the measurement result, as well as contamination of the surface – rust, frost, dirt, oil etc. - and the space between the object and the thermal camera – as dust, steam, smog etc.

The emissivity value of different objects ranges from 0.01 to 1, as the range of emissivity adjustment of this device. Refer to the below table of emissivity values to set up the emissivity.

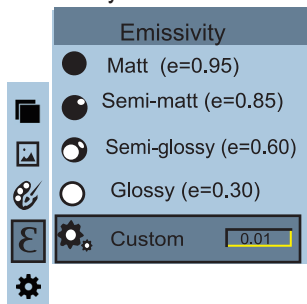
The emissivity of most organic materials and painted surfaces is around 0.95, which is also the default setting of this device.







## 4.2. Emissivity setting

The imager provides four preset values of emissivity:

- Coarse object (0.95)
- Semi-matte object (0.85)
- Semi-shiny object (0.60)
- Shiny object (0.30)

According to the characteristics of the measured objects, users may set the emissivity value manually - refer to the table of “emissivity of common materials”.






1. Press the “MENU/  key to enter the main menu.
2. Select  (emissivity) submenu and press the  key to enter the emissivity options list.
3. Press the  and  keys to select the emissivity.
4. Press the “SELECT/ENTER key to confirm the selection.
5. Press the  key again to return.








6. If you selected to set the emissivity manually, press the "SELECT/ENTER" key to enter the editing. Press the ◀ / ▶ keys to select the digit to be changed, press the ▲ and ▼ keys to change the value. After completing the setup, press "SELECT/ENTER" to confirm, then press ◀ to return. The MENU/ ⏏ button exits the menu.

### 4.3. The emissivity value of common materials


| Substance | Thermal radiation | Substance             | Thermal radiation |
|-----------|-------------------|-----------------------|-------------------|
| Bitumen   | 0.90~0.98         | Black cloth           | 0.98              |
| Concrete  | 0.94              | Human skin            | 0.98              |
| Cement    | 0.96              | Foam                  | 0.75~0.80         |
| Sand      | 0.90              | Charcoal dust         | 0.96              |
| Earth     | 0.92~0.96         | Paint                 | 0.80~0.95         |
| Water     | 0.92~0.96         | Matte paint           | 0.97              |
| Ice       | 0.96~0.98         | Black rubber          | 0.94              |
| Snow      | 0.83              | Plastic               | 0.85~0.95         |
| Glass     | 0.90~0.95         | Timber                | 0.90              |
| Ceramics  | 0.90~0.94         | Paper                 | 0.70~0.94         |
| Marble    | 0.94              | Chromium hemitrioxide | 0.81              |
| Gypsum    | 0.80~0.90         | Copper oxide          | 0.78              |
| Mortar    | 0.89~0.91         | Ferric oxide          | 0.78~0.82         |
| Brick     | 0.93~0.96         | Textile               | 0.90              |

## 5. “Settings” sub-menu


Press the MENU/  key to select the  (settings) option in the main menu. Press the  key again to enter the “settings” sub-menu.

| Settings  |               |  |
|---|---------------|--|
|  Auto shutdown ▶ | Auto shutdown | NO<br>5min<br>20min  |
|  Intensity ▶     | Intensity     | Low<br>Medium<br>High  |
|  Language ▶      | Language      | English<br>Chinese<br>Italian<br>German  |
|  Unit ▶          | Unit          | Celsius<br>Fahrenheit  |
|  Time format ▶   | Time Format   | 24 hour<br>AM/PM   |
|  Set time ▶     | Set time      | Year           2017<br>Month         12<br>Day            28<br>Hour          15<br>Minute       15<br>Second       15 |
|  Spot ▶        | Spot          | Off<br>On  |


### 5.1. Auto shutdown setting

After entering the "Settings" sub-menu, select  (automatic shutdown), press the ► key to enter the auto power off setting. Set one of the options: NO Automatic shutdown, Automatic shutdown in 5 minutes or Automatic shutdown in 20 minutes.

### 5.2. Intensity settings


After selecting  (brightness), press the ► key to enter the brightness setting. Set to low, medium, or bright.

### 5.3. Language settings


After selecting  (language), press the ► key to enter the language setting.

Set one of 4 languages: English, Chinese, Italian, German.

### 5.4. Unit setting

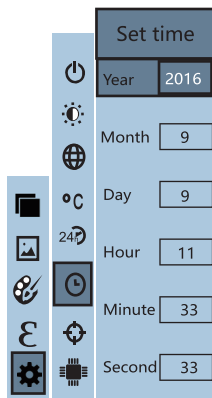
After selecting  (unit), press the ► key to enter the temperature unit setting. Set Celsius or Fahrenheit degrees.









### 5.5. Time format setting

After you select  (time format), press the ► key in the navigation key to enter the time format setting. Set to 24 hours or 12 hours format.


## 5.6. Time setting

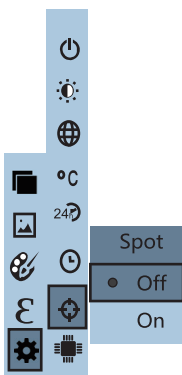
1. After selecting  (set time), press the  key to enter time setting.







2. Press  /  to select year/month/day/hour/minute.
3. After selecting, press the “SELECT/ENTER” key to edit.
4. Press the  and  keys to select the digit to be changed.
5. Press the  /  key to change the value. After completing the change, press “SELECT/ENTER” to confirm.
6. After the time setting is completed, press the  key to return.
7. Press “MENU/  to exit from the menu.

## 5.7. Enable/disable the display of highest and lowest temperature cursors:

1. After selecting  (cold / hot spot), press the  key to enter the cold / hot spot setting.



2. Press  /  key to select “enable” or “disable” the cursors display.
3. Press “SELECT/ENTER” key to confirm selection. After the setting is completed, press the  key to return. Press the MENU/  key to exit from the menu.



## TROUBLESHOOTING

If you encounter any problem when using the thermal imager, please refer to the following table for a possible solution. If the problem is not solved, please turn the device off and contact the supplier to repair.

| Failure description                                 | Possible cause                              | Solution  |
|---|---|---|
| The thermal imaging device cannot start             | Low battery charge                          | Charge the Battery.   |
| The thermal imaging device powers off automatically | Low battery charge                          | Charge the Battery.   |
|   | The time set for automatic power off is due | Restart, change the time for automatic power off after restarting<br><br>(refer to 5.1) |



## **WARRANTY**

This product is covered by a two-year limited warranty against defects in materials and workmanship. The warranty does not cover products that are used improperly, altered or repaired without Kapro Tool's approval. In the event of a problem with the device, please return the product to the place of purchase with proof of purchase.

Model #399

### **CE CONFORMITY CERTIFICATE**

This product meets the standards of the Electromagnetic Compatibility (EMC) established by the European Directive 2014/30/EU and the Low Voltage Directive (LVD) 2014/35/EU

### **EC DECLARATION OF CONFORMITY**

We declare under our responsibility that the product 399 is in accordance with the requirements of the Community Directives and Regulations:

2014/30/EU

2011/65/EU

EN60825-1: 2014

EN61326-1: 2013



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