

User Manual

Thermal Expert™

(QVGA 384 x 288 17μm)

(VGA 640 x 480 17μm)



Thermal Expert™_QVGA

Thermal Expert™_VGA



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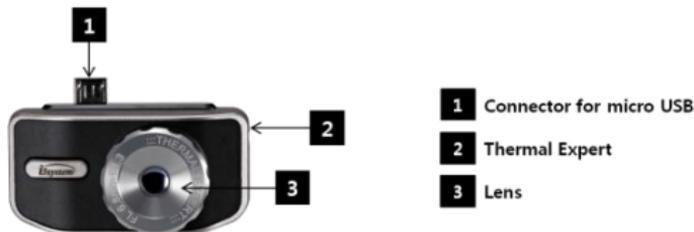
1. Product Introduction

1.1 product constitution

		
TE – Q1 6.8mm lens	TE – Q1 Pro 6.8mm lens	TE – Q1 Plus 13mm lens
		
TE – V1 19mm lens	13mm lens (optional for TE – Q1)	6.8mm lens (optional for TE – Q1 Plus)
		
8.5mm lens (optional for TE – V1)	19mm lens (default for TE – V1)	25mm lens (optional for TE – V1)

		
35mm lens (optional for TE – V1)	Application	Carrying Case (including optional lens)
		
Bracket for Smartphone (Optional)	Tripod-stick (Optional)	OTG Extension Cable (Optional)

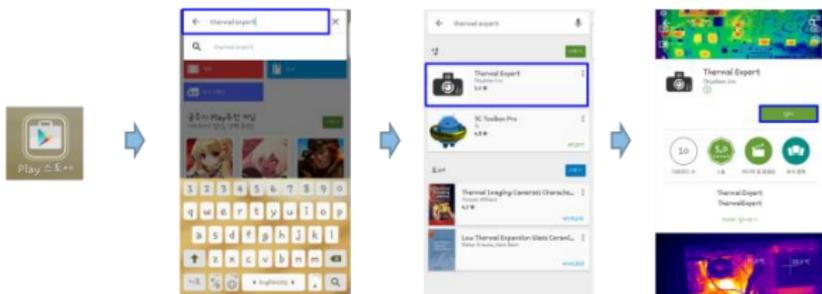
1.2 Part Name of Thermal Expert



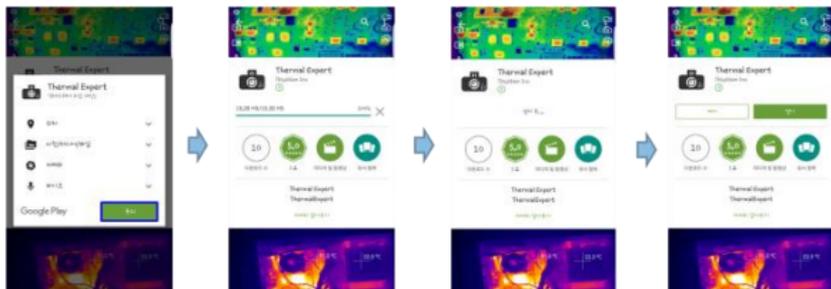
1.3 Installation Method for Thermal Expert_ App

- Find the latest version of "Thermal Expert" application in Google Play Store.
- Choose Thermal Expert app with icon as below.
- Tap on the "Install" and tap on the "Accept".

- ④ Please note that the “Thermal Expert” app. will run only when the product is connected to the device through USB connector.



- ⑤ When the “Thermal Expert” is plugged into the device, the thermal expert app. will run automatically (Plug and Play).



1.4 Operation Method



- ① Plug the Thermal Expert into the micro USB of any Android device directly or by using a USB extension cable.
- ② The "Thermal Expert" app. will run automatically when it is connected. (Plug & Play) After a few seconds, tap on the icon "3" as shown in the picture to run image calibration.(image tuning)
- ③ You may adjust the focus (refocus) by turning the lens to sharpen the focus for the distance of the target.
- ④ For self-shot, you can use the tripod stick (optional) turning the bracket over to your direction. In that case, you'll need to change the setting of flip and mirror in the General Settings menu.

1.5 Method of using accessory Kit

- ① As shown in the picture, you can fix your smart phone and Thermal Expert using holder bracket.



- ① Thermal Expert can be connected into the device using a micro USB extension cable or directly.



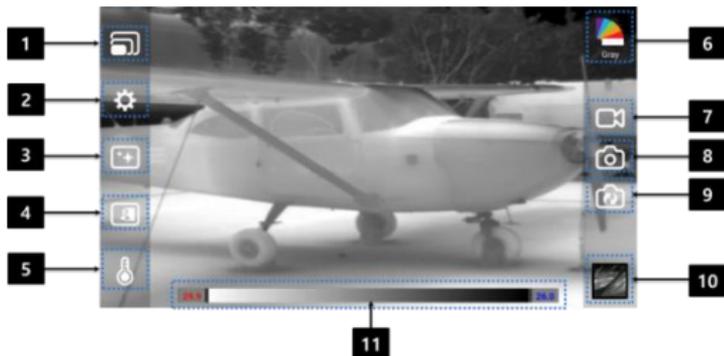
- ① Thermal Expert can be connected to smartphone using a USB cable and holder.



- ① Self-shot is possible by turning over the bracket to your side.
- ② In this case, you may change the setting using Flip and Mirror menu.



1.6 Description for application menu of Thermal Expert.



① Digital zoom

- The picture image can be magnified by selecting resolutions.

② General setting

- Both or selective saving of the infrared and the visible image shot or movie.
- Temperature display by Fahrenheit or Celsius.
- Temperature compensation Turn On / Off.

③ Image processing

- Uniformity of the brightness image.
- Automatic gain control.

④ Image View

- 5 different methods of image view of infrared and visible images.
(50 : 50 View, Twin View, Overlay View, Floating View, and FOV Adjust View)

⑤ Temperature measurement

- It provides many methods of temperature measurement.
(Point, Min/Max, Line, Rectangle, Circle, Alarm, Emissivity Setting)
- It can display the temperature of the point and the area which was selected in

many ways.

⑥ Color map(Color Palettes)

- Using the 12 types of color maps, the user can select preferred color display. (Gray, Black hot, Hottest, Coldest, Iron, Rainbow, Medical, Purple, Blaze, Aqua, Red, Green)
- White color (Bright color) used to represent high temperature, in the meantime, the black color (dark color) or purple color used to represent the low temperature. (In case of Black Hot, it represents opposite temperature)

⑦ Video shot

- When you take the video shot, it is saved at the "Gallery".
- You can browse them using your browser app in the device.

⑧ Snap shot

- When you take the snap shot, it is saved at the "Gallery".
- You can browse them using your browser app in the device.

⑨ Image correction

- For more uniform image, flat field correction can be applied.
- Flat field correction can be done either by closing the lens cap or covering the lens with a flat surface in the temperature perspective. (Manual shutter)
- You may wait for several seconds for flat field correction procedure.

⑩ Viewer

- You can browse the pictures in the Gallery of the device.
- You can select All, Image and Video by tapping on the icon of the device.

⑪ Level Span

- Depending on the input temperature value, adjustable clear of the image.
- If you select the AGC, the temperature of the Max, Min value is adjusted automatically.

2. Product Specification

2.1 Detailed Specification

2.1.1 QVGA

	TE - Q1	TE - Q1 Pro	TE - Q1 Plus
Array format	384X288		
Pixel Pitch	17 μ m		
Wavelength Band	8~ 14 μ m (Longwave Infrared)		
Sensitivity	0.05 $^{\circ}$ C		
Frame rate	< 9Hz		
Scene range temperature	-10 $^{\circ}$ C ~ 150 $^{\circ}$ C	-10 $^{\circ}$ C ~ 250 $^{\circ}$ C	-10 $^{\circ}$ C ~ 120 $^{\circ}$ C
Operating temperature	-10 $^{\circ}$ C ~ 50 $^{\circ}$ C		
Power consumption	~500mW		
Weight	< 39g with lens	< 39g with lens	< 42g with lens
Dimension (W x H x D)	47mm x 25mm x 16mm (Without Lens)		
Interface	USB OTG, Micro USB		
Platform	Window, Android		
Type of Lens	6.8mm / f/1.3	6.8mm / f/1.3	13mm / f/1.0
FOV[$^{\circ}$]	56.3 $^{\circ}$ (H) x 41.8 $^{\circ}$ (V) - 71.4 $^{\circ}$ (D)	56.3 $^{\circ}$ (H) x 41.8 $^{\circ}$ (V) - 71.4 $^{\circ}$ (D)	28.7 $^{\circ}$ (H) x 21.7 $^{\circ}$ (V)- 35.3 $^{\circ}$ (D)

2.1.2 VGA

Array format	640 x 480
Pixel pitch	17 μ m
Wavelength Band	8~14 μ m (Longwave Infrared)
Sensitivity	< 0.05°C (50mK) @ 25°C
Frame rate	< 30 Hz
Scene range temperature	-20 ~ 150°C
Operating temperature	-10 ~ 50°C
Weight	< 60 g (Without Lens)
Dimension (W x H x D)	47mm x 25mm x 16mm (Without Lens)
Interface	Micro USB OTG
Platform	Windows, Android
Type of Lens	8.5mm f/1.2, 19mm f/1.0, 25mm f/1.2, 35mm f/1.2

2.2 Feature of Thermal Expert

2.2.1 Key Features of Product

- ① Temperature measurement for whole pixels
- ② Temperature measurement
- ③ Convenient image of both infrared and eye visible range in one shot
- ④ Easy user interface (digital zooming, color palette.....)
- ⑤ Interchangeable Lens

2.2.2 Key Feature of Application

- ① Color palettes (12 color maps)
- ② Images (IR, visible with snapshot and video)
- ③ Digital zooming (384 x 288, 320 x 240, 240 x 160, 160 x 120)
- ④ Infrared Image view along with visible image
(50:50, Twin, Overlay, Floating)
- ⑤ Temperature Measurement
(Alarm, Min/Max, Point/Line/Rectangle/Circle profile)
- ⑥ Report creation (Generate PDF report)

2.2.3 Dimension of Product

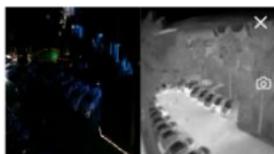


Dimension (W x H x D) : 47mm x 25mm x 16mm (without lens)

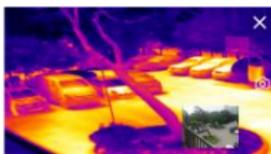
2.2.4 Snapshot Image of Thermal Expert



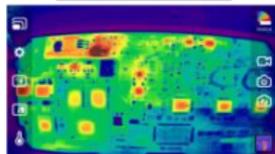
Inside the desktop with the temperature measurement



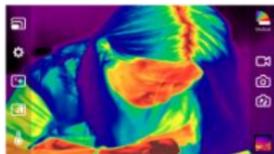
Parking lot with thermal and visible synthesis (twin view)



Parking lot with thermal and visible synthesis (floating view)



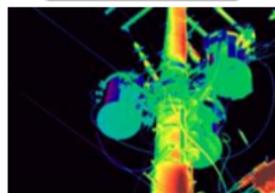
Printed circuit board



Human



Parking lot with the temperature measurement



telephone pole



Stadium



Dinner

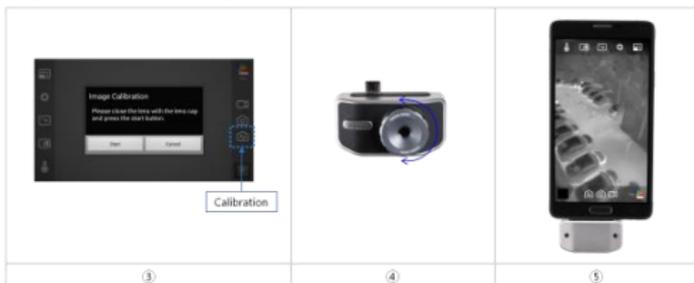
3. Method of Operation

3.1 Operation procedure

- ① Connect the Thermal Expert to Smartphone via micro-USB.
(※ If Thermal Expert disconnected, the application will close automatically)
- ② The application is loading with THERMAL EXPERT logo.



- ③ Image calibration (manual shutter operation) is fulfilled with lens cap for several seconds. After that, user can detect targets after removing the lens cap.
※ Recommended to apply the manual shutter operation just after power on or during the operation whenever non-uniformity appears.
- ④ Adjust the camera lens to get focused image.
- ⑤ Shooting an Infrared image.



3.2 Method of rebooting the application

3.2.1 When the application closed through "Home" or "Back" button of Android Smartphone

- ① Tap the bottom "window shape" menu or select Thermal Expert application in the operating application lists.
- ② Run the application again.

3.3 When Thermal Expert camera is not detected by the Smartphone

3.3.1 Method of connecting the devices

- ① Unplug Thermal Expert and plug it to Smartphone again.
- ② If the connection cannot be completed, try to clear the temporary memory your Smartphone, and then plug- in Thermal Expert again.

※ Method of clearing the memory (using your Smartphone)

- Samsung Galaxy Series : Select the bottom "window shape" button or Push "Home" button for several seconds and then close the operating applications.
- LG G Series : Select the bottom "window shape" button and then close the all operating applications.
- Galaxy S6 : Select the left bottom "window shape" button → Close all.

3.4 Details of each smart phone operation

① Samsung Galaxy Series

- Select the bottom "window shape" button or push "Home" button for several seconds and then close the operating applications.

※ Show up the widget in the application manager (task manager) → Select the operating applications → RAM → Clear the RAM



② LG G Series

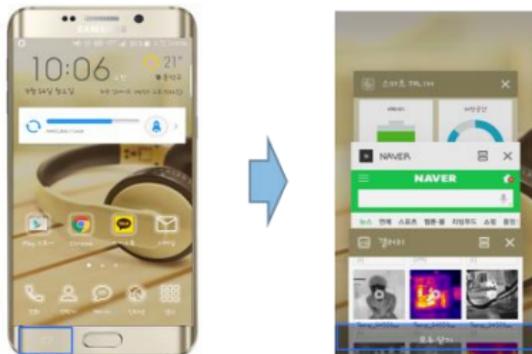
- Select the bottom "window shape" button and then close the all applications.

※ Task manager → Select the operating applications → Close the operating applications.



③ Galaxy S6

- Select the left bottom "window shape" button → Close all
 - ※ Run smart manager → Clear all



4. Description of Thermal Expert application

4.1 Opening screen

- ① Opening screen of the application.
- ② The application is loading with THERMAL EXPERT logo.



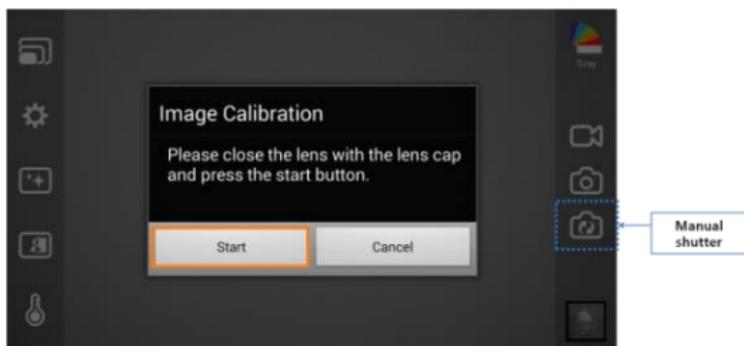
4.2 Main Screen & Menu

- ① Main display of the application.
- ② Right side: color map, video capture, image capture, image calibration, viewer.
- ③ Left side: digital zooming, general settings, image processing, thermal & visible synthesis, temperature measurement.



4.3 Non Uniformity Correction

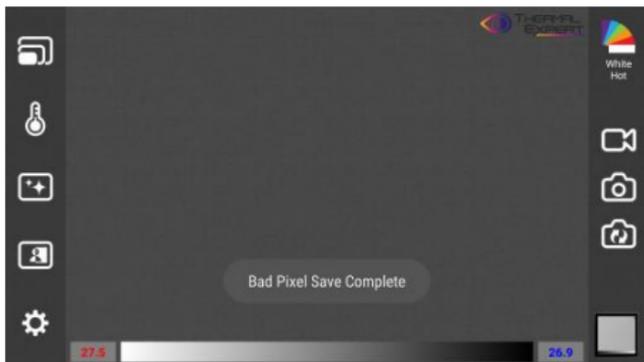
- ① This operation is to clear the initial non-uniformity on the image.
- ② Cover the lens with lens cap or looking at the uniform target, and press this menu. The manual calibration will be completed for a few seconds. After that, user can detect targets after removing the lens cap.



- ③ It is recommended to use the manual shutter operation just after the power is switched on or during the operation whenever non-uniformity appears.



- ④ At the same time operating the manual shutter with bad pixel calibration. If you can see this sentence "Bad Pixel Save Complete", bad pixel calibration is finished.
- ⑤ "dead.bin" is generated in i3cam folder of device storage.



4.4 Image Capture

- ① Capture and save the image.
- ② Save only the thermal image or both the thermal and visible image simultaneously by applying General settings.
- ③ Press this button, and then the image upon General settings will be saved on the gallery.



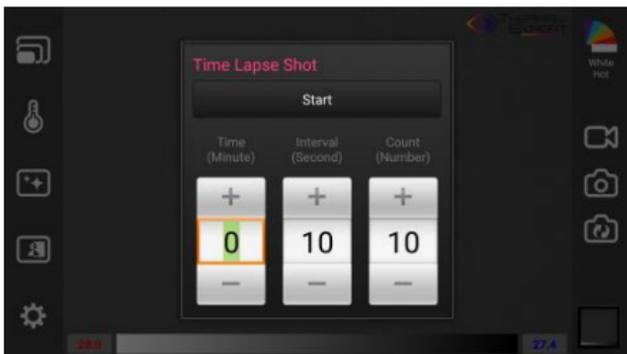
N.B. There are three image save options, selectable in the General Settings menu

- a. Save only the thermal image
- b. Save the thermal and visual image at the same time
- c. Save the thermal image with temperature data, and the visual image at the same time

* There should be an illustrated image shown for each.

- ④ TimeLapse function is operated by long touch the image capture button for 1 second.

Ex) Interval : 10, Count : 10 => shooting a every 10 seconds, total 10 times.



4.5 Video Capture

- ① Capture and save the video.
- ② Save only the thermal video or save both the thermal and visible video simultaneously by applying General settings.
- ③ Press this button, and then the video upon General settings will be saved in the gallery with the sound.
 - Press this button, and then video recording will start with the sound.
 - After starting, in the upper left side recording indicator will appear with recording time.
 - Press this button again to stop the recording and save the video in the gallery.



4.6 Viewer

① File folder of the image and video in the gallery

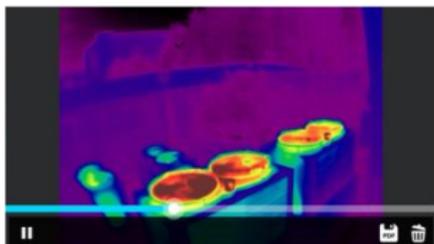
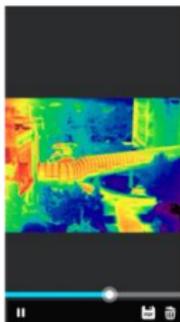
- Video file folder : DCIM / I3Systems, video file name : VID_day_time.3gp
- Image file folder : DCIM / I3Systems, image file name : IMG_day_time.jpg



- ② Press viewer button to check out the saved image and video in the gallery.
- ③ User can check out the saved images and videos by selecting all image and video folder respectively.

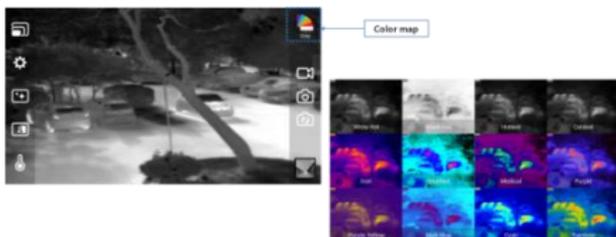


④ Select the video for playing.



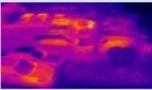
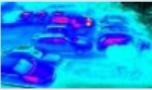
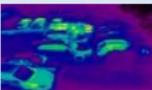
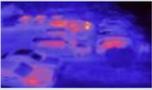
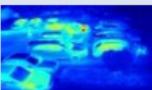
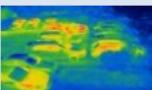
4.7 Color Map

- ① Select the color map button, and the application provides 12 color palettes. (White Hot, Black Hot, Hottest, Coldest, Iron, Blue Red, Medical, Purple, Purple Yellow, Dark Blue, Cyan, Rainbow)
- ② Infrared color maps provide white and red for hot temperature, black and purple for cold temperature (※ Black-Hot is opposite mapping).



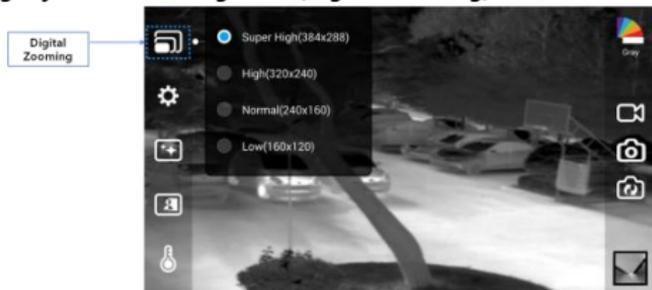
① Description for Color map

Color	Description	Image
White Hot	It shows white for hot temperature and black for cold temperature.	
Black Hot	It shows black for hot temperature and white for cold temperature (※ Black Hot is the opposite of White Hot)	
Hottest	It shows the hottest spot with red based on White Hot color map.	
Coldest	It shows the coldest spot with blue based on White Hot color map.	

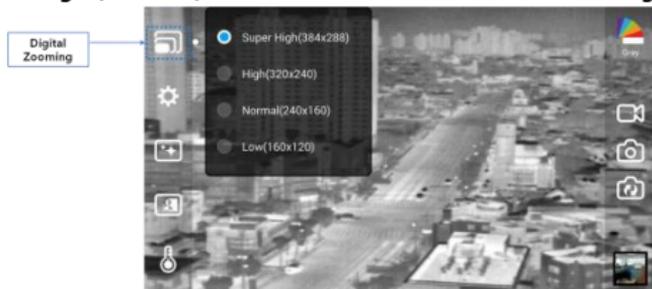
<p>Iron</p>	<p>It shows bright red for hot temperature and purple for cold temperature, and this setting is preferable for displaying human images.</p>	
<p>Blue Red</p>	<p>It shows red for hot temperature and blue for cold temperature.</p>	
<p>Medical</p>	<p>It is suitable for showing human images. (Hot temperature-red, cold temperature - purple)</p>	
<p>Purple</p>	<p>It shows the temperature based on purplish color and it is useful for normal uses.</p>	
<p>Purple Yellow</p>	<p>It shows the temperature as yellowish based on purplish color and the hot temperature spot is shown with bright color.</p>	
<p>Dark Blue</p>	<p>The low temperature spot is shown with bluish color and the hot temperature spot is shown with red color.</p>	
<p>Cyan</p>	<p>It shows the temperature based on cyan color and the higher temperature shows brighter.</p>	
<p>Rainbow</p>	<p>It shows the temperature based on rainbow color and it is suitable for showing human images.</p>	

4.8 Digital Zooming

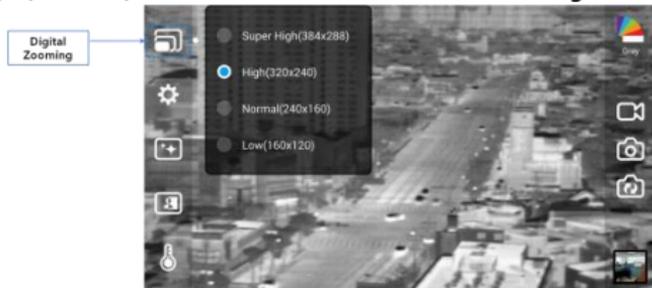
- ① Resize the image by setting resolution.
- ② Magnify or reduce image size (Digital Zooming).



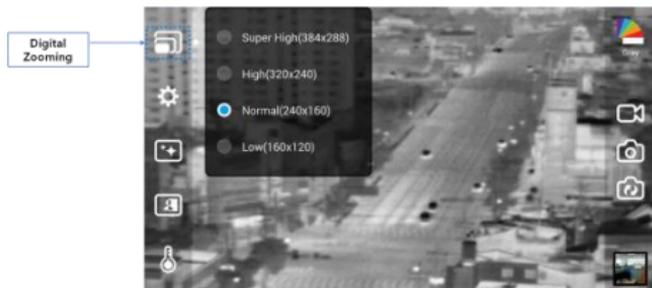
- ③ Super High (384x288) : It shows the 384 x 288 resolution image.



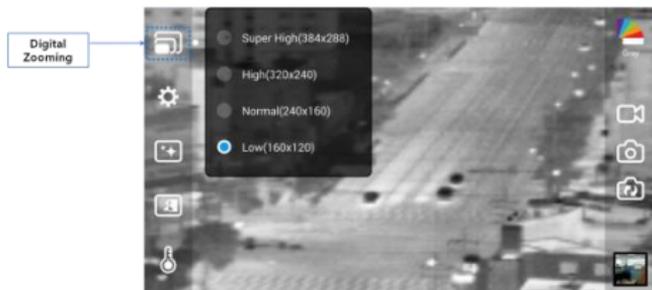
- ④ High (320x240) : It shows the 320 x 240 resolution image.



- ⑤ Normal (240x160) : It shows the 240 x 160 resolution image.

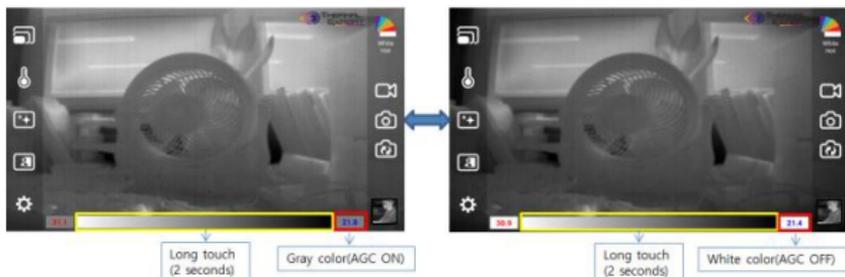


- ⑥ Low (160x120) : It shows the 160 x 120 resolution image.



4.9 Level Span

- ① By setting the max, min value of the temperature, image will be adjusted.
- ② If you select the AGC, the temperature of the Max, Min value is adjusted automatically. AGC On is default setting. The color of temperature textbox is gray in AGC ON. It is impossible to change level span in AGC ON. So, AGC should be off for changing level span.
- ③ The way to change AGC ON to AGC OFF simply is long touch the level span bar for 2 seconds. It is toggle function.



- ④ It is possible to change the temperature with touching level span bar and drag left or right. If the drag is left, Min/Max value is higher than before at the same time. If the drag is right, Min/Max value is lower than before at the same time.



- ⑤ If you want to change just Min value, you have to touch Max textbox.

After that, lock icon appear in right side of the Max textbox. It means that Max value is fixed and Min value can be changed.



- ⑥ If you want to change just Max value, you have to touch Min textbox.

After that, lock icon appear in left side of the Min textbox. It means that Min value is fixed and Max value can be changed.



4.10 General settings

① General settings of saving image and video, and temperature

- Image

- Thermal Image Only: save only the thermal image.
- Thermal & Visible Image: save both the thermal and visible image.
- Thermal & Visible Image & Temperature : Save the thermal image with temperature data, and the visual image at the same time

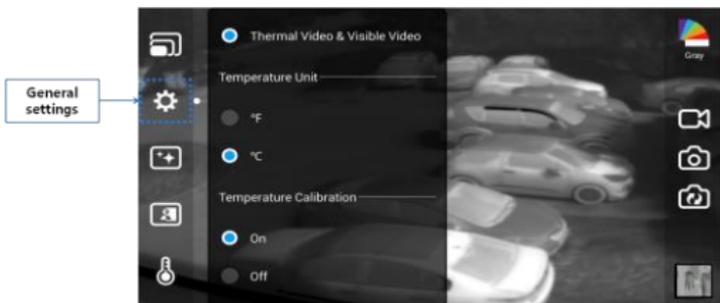
- Video

- Thermal Video: save only the thermal video.
- Thermal Video & Visible Video : save both the thermal and visible video.



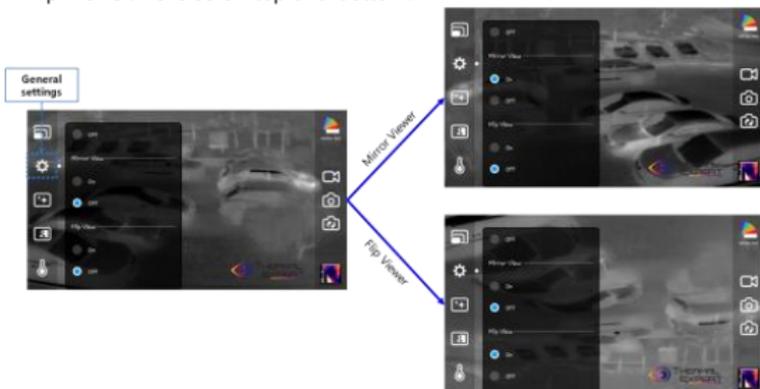
② Temperature display and Temperature calibration function

- Temperature Unit (°F, °C) : choose Fahrenheit, Celsius for temperature display.
- Temperature Calibration : temperature calibration On/Off.
(By setting this option, user can turn on or turn off the initial temperature calibration just after power on)



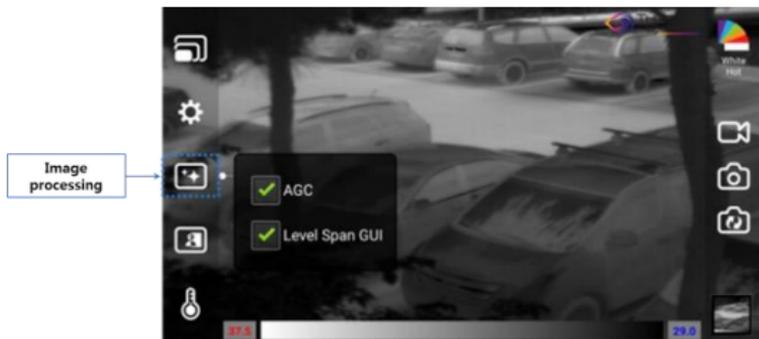
③ Setting output image upon camera position

- Mirror Viewer: Reverse on left and right.
- Flip Viewer: Reverse on top and bottom.



④ Image Processing

- AGC (Automatic Gain Control)
 - a) Automatic control of the image contrast.
 - b) This maintain the color gradation by leveling the brightness based on the intensity of radiation.



⑤ Thermal & Visible synthesis

- Display the thermal and visible image in the various ways.
- Provide 5 ways to synthesis the thermal and visible images.
(50 : 50 View, Twin View, Overlay View, Floating View, FOV Adjust View)



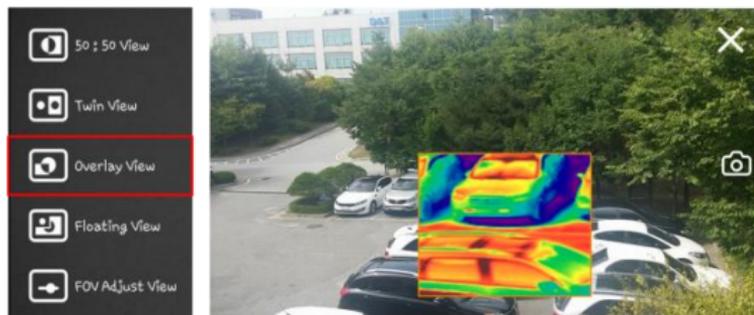
- Display both the thermal and visible image in two halves of screen for convenient contrast viewing.



- Display the thermal and visible image equivalently on the screen.



- Overlay the thermal image on the visible image. Draw the rectangular shape on the screen, and the thermal image will be shown in the selected rectangular spot on the visible screen.

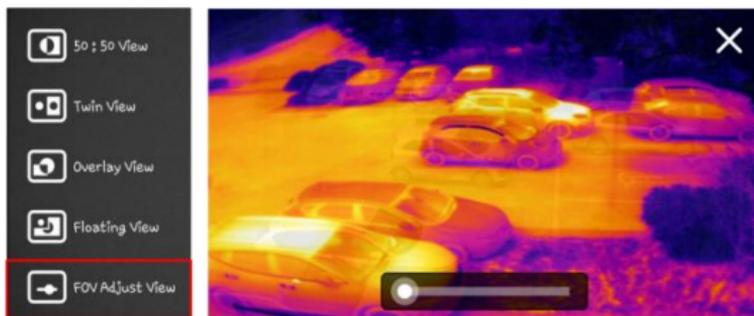


- Select this menu. The small visible image will be shown on the thermal screen. User can move the small visible image anywhere by dragging using his or her fingertips.



- This menu can adjust the field of view (FOV) of the visible image in order to fit with the thermal image.
- User can adjust the field of view (FOV) of the visible image by scrolling to the bottom of the scroll bar.

(Screen is overlapped with the thermal and transparent visible image.)

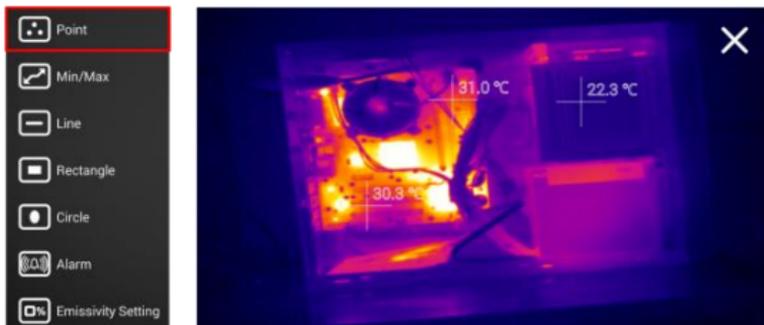


⑥ Temperature measurement

- Thermal Expert provides various temperature measurement methods.
(Point, Min/Max, Line, Rectangle, Circle, Alarm, and Emissivity Setting)
- User can measure temperature for selected point and area.



- Point : Highlight or select a specific point on the screen for 2 or 3 seconds, and the temperature will be shown (1~5 point or maximum 5 point).



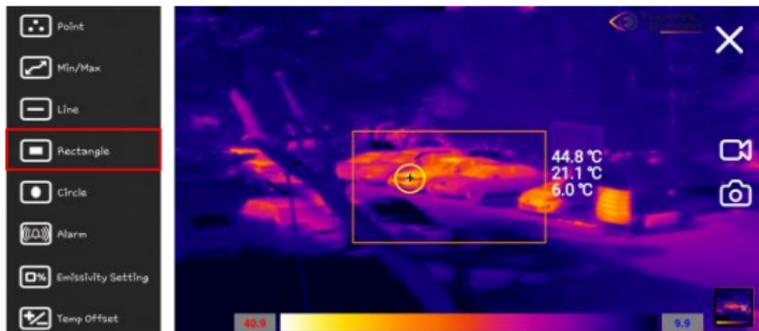
- Min/Max : Select this menu and both the Min and Max temperature will be displayed at the same time in real time.



- Line : Draw the horizontal line, and the temperature profile will be shown with average, maximum and minimum temperature displayed.



- Rectangle : Draw the rectangle shape, and maximum, average, and minimum temperature will be shown. User can see the highest temperature point in rectangle area.



- Circle : Draw the circle shape, and with maximum, average, and minimum temperature will be shown.



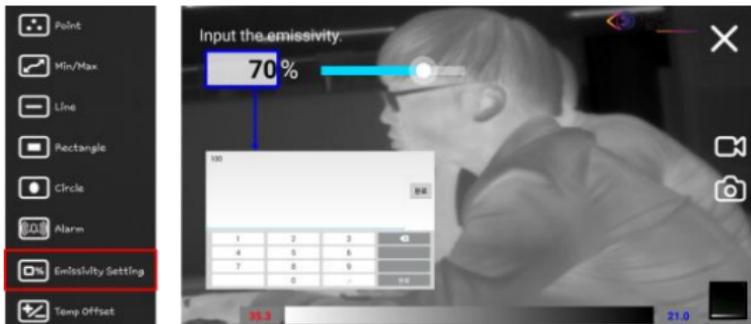
- Alarm

- Select this menu and set the threshold temperature. It can show the spot with red color where the temperature is over set point, and indicate the maximum temperature and sound an alarm.
- If user draw the rectangular shape on the screen, this function is operated in the selected area.



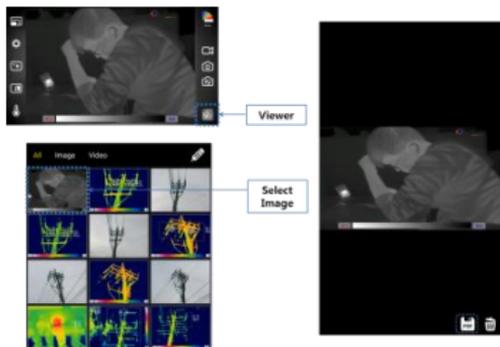
- Emissivity Setting : Input the emissivity of the target object or touch the bar.

The temperature is calculated based on the entered emissivity.



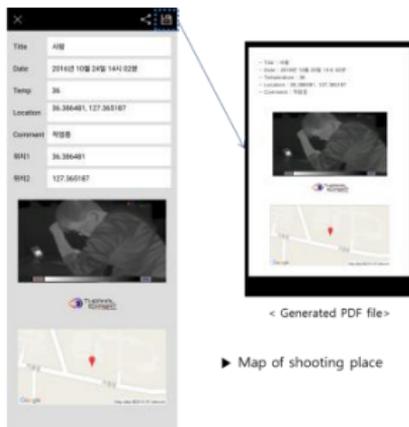
- Report Function

- a) Choose the image in the Viewer on the Application, and put the pdf button. Report generator will be launched.
- b) Type the title, date, ambient temperature location and comment, and then put the save button. Pdf file will be generated.



< In the case of selecting image >

- c) PDF file folder : i3cam/PDF, PDF file name : day_time.pdf



< Report information >

< Generated PDF file>

▶ Map of shooting place

d) Same way as saving image.

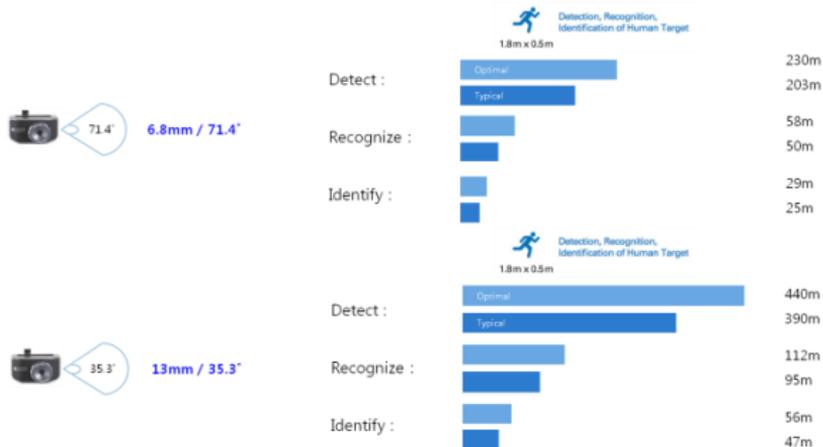


5. Lens Specification

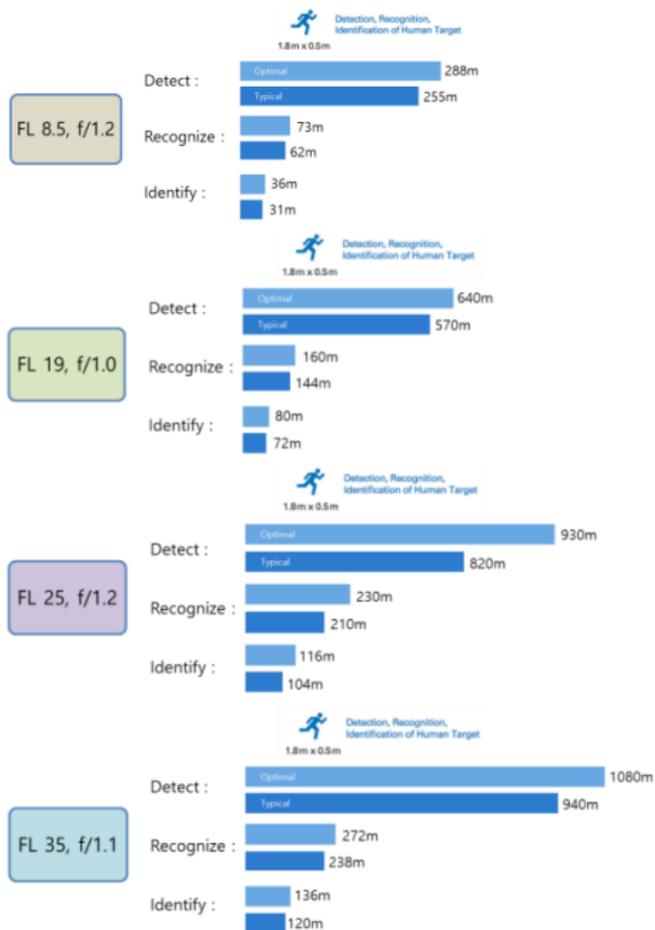
5.1. Lens Performance

- ① **Detection, Recognition, Identification of Human Target for each Lens (DRI Chart).**

5.1.1 QVGA



5.1.2 VGA



6. Distributor and Manufacturer Contact

6.1 Distributor Contact Europe

Voltagezone Electronics e.U.

Rossmanngasse 20a

8010 Graz Austria/Europe

Phone: +43 (0) 677 621 82 555

e-mail: info@thermalexpert.eu

Webside: www.thermalexpert.eu

6.1 Manufacturer Address

i3system, Inc, _ Jang-Dong

26-32, Gajeonbuk-ro, Yuseong-gu, Daejeon, 34113 Republik Korea

Webseite: www.i3-thermalexpert.com