COX Thermal Imaging Cameras
Radiometric/Security/Network
Automotive NightVision

Thermal Camera Fever Detection

Thermal Camera
Quarantine at the airport
Fever Screening in public area

1. Introduction

As tremendous number of people move from one country to another for reasons such as tourism and trade, respiratory diseases like SARS, Zika virus cases, MERS and the infection by new corona virus have terrorized the world every few years, one after the other. In particular, the respiratory disease caused by the new corona virus, which was recently reported to have started in the Chinese city of Wuhan, has become so rapid that it became a very important task to separate person with fever from others, not only in quarantine officials in all airports and ports but also in schools, hospitals, hotels, resorts, sports stadiums, and other public areas where there are a lot of people coming and going.

COX Co., Ltd. which has devoted itself to the development and production of various un-cooled thermal cameras since its establishment in 2010, proposes reliable and cost-effective fever detection & screening packages that identify a person with a fever in public facilities such as airports, ports, schools, hotels, resorts, sports stadiums, and hospitals based on its various experience in the domestic and overseas markets.

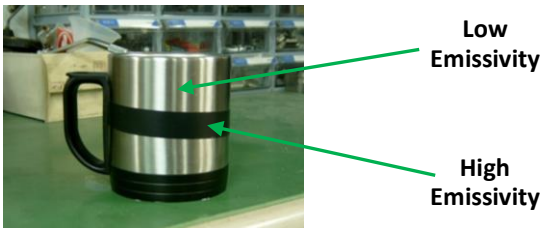
2. Temperature measurement and fever detection

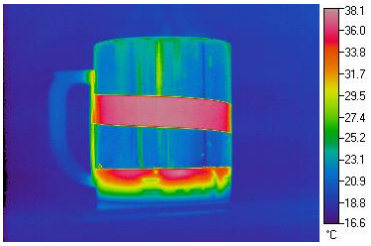
Screening people with fever using a thermal camera is basically utilizing the temperature measurement function of the thermal camera, which is the basic function of the thermal camera.
People who move in public areas naturally wear clothes, so we have to measure the temperature of the exposed face of the body.
Wearing a mask on the face makes the exposed face area too small, and we can measure the temperature of face accurately, and we have to arrange people to take off the mask when people pass by the camera.

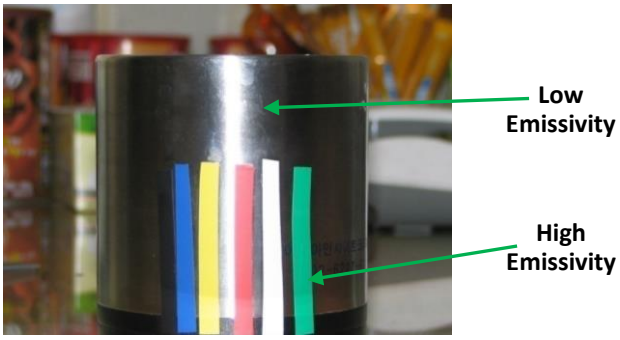
Temperature we measure using radiometric thermal camera is an absolute value?
Some camera companies insist it is absolute value with an accuracy of +/-0.5℃, but we have to frankly say thermal cameras including FLIR cameras measure relative temperature, that is, temperature difference between objects in the image, with an accuracy of +/-2, due to very technical reasons described below.

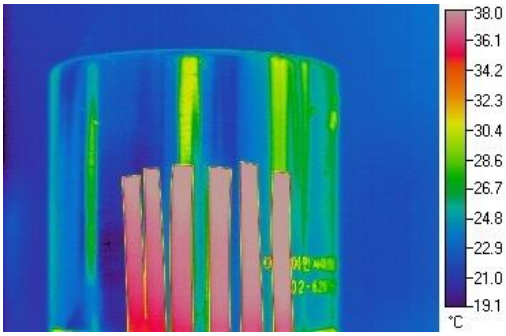
The principle of the thermal camera is to take infrared radiation from the objects above absolute temperature of 0K and then make image and obtain temperature values through a complex algorithm. The amount of infrared radiation from the object depends on emissivity of the object. If the emissivity of the object is high, measured temperature by thermal camera is high.
What is very interesting is emissivity of the object varies by material of object, surface treatment,

color and others.









If the temperature of the human body is 37 degrees Celsius, the temperature of the face is exposed to the atmosphere, which removes heat from the face, and consequently real temperature of the face is naturally below 37℃.

As explained earlier, thick make-up on a person's face would make a difference in emissivity, and even at the same temperature of the body, the temperature of the face measured by the thermal camera would be different. Further, temperature of the face of persons of white, yellow, or black shall be different, even though real body temperature is same. For those who sweat on the face a little more than others, the face temperature measured by thermal camera will appear relatively lower, as the evaporation of the water of sweat will cause them to subtract more heat. It also depends on whether the camera reads the temperature of face by looking directly at the face and looking at the face at the angle. Of course, if camera looks at a person's face and measure it, the temperature measured will be a little higher.
The thermal camera is a very sensitive device, so temperature measurements change if there is a little wind or humidity changes in the area where the camera is installed.

There are a number of other factors that change the temperature of a person's face.
Therefore, when measuring the temperature of a person's face with a thermal camera with a purpose of detecting a person with fever, the measured value should not be considered an absolute temperature value but should be recognized as a relative temperature value.
It should be thought that identifying people who have fever with a thermal camera is identifying people who have relatively high facial temperature compared to others, in a group.

After finding a person whose face temperature is relatively higher than others with a thermal camera, you can accurately measure the temperature in the ear using ear thermometer and determine whether the person has or does not have a fever.
After all, the thermal camera is used to identify people who are likely to have the fever and the final judgment is after you measure the temperature of selected person using ear thermometer.

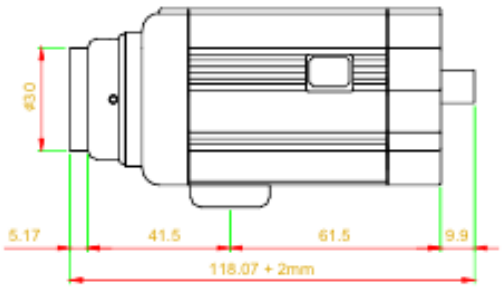
3. Components of the fever detection package

The system includes the following components for screening people with relatively high facial temperature from people pass by the thermal camera.
Since it is usually a measure of a person's face temperature within a distance of 20 meters, consider the camera price and choose a 384x288 resolution camera rather than a 640x480 resolution camera, and the lens with a horizontal FOV between 44° and 20°.

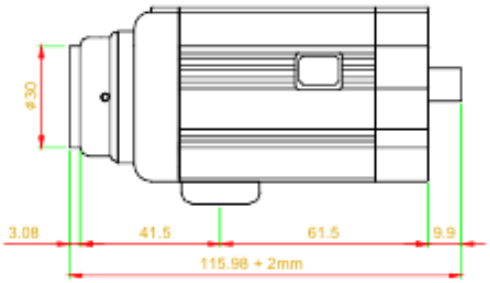
1) Radiometric thermal camera
   Thermal camera for temperature measurement of medial measurement range between 20° and 50° or thermal camera for temperature measurement of normal measurement range which is up to 120°

   Model name of COX thermal camera is CG320.

   Lens: We recommend to adopt athermalized lens of 8.13mm f1.16 and 15mm f1.0.
   FOV of those lenses are 47.4°/35.1 when paired with CG320 and 24.5°/18.5°, respectively.



CG320 paired with 8.13mm athermalized lens



CG320 paired with 15mm athermalized lens

2) PC software

Software that processes the temperature raw data sent by the camera through the IP network to show the thermal image, perform various analysis, and record thermal image or temperature data as per the set parameters when a person with a face temperature higher than the set temperature is detected.

In the package of CG320, several different kinds of PC software are included free of charge.

a) Thermal imaging analyzer

Software that processes data from one camera

b) Quad channel analyzer

Software that processes data from up to four cameras to show the thermal image and perform various analysis

c) Camera controller

Access to the camera via IP network and set various parameters like ROI setting, temperature setting in ROI, and others.

3) PC or laptop

This is to run PC software such as the thermal imaging analyzer or quad channel analyzer, execute various analysis, and store thermal images or temperature data with the parameters set when the alarm is triggered.

4) Warning lamp

If the face temperature is above the set temperature, the camera outputs an alarm signal.

When the warning lamp flashes, the inspector calls the person and checks the temperature inside the ear to check if the person has a fever.

Warning lamps are not within the scope of the COX supply.

The power supply of the warning lamp and the cabling for receiving alarm signals from the camera shall be handled by the user, referring to the information described in this document.

5) Tri-pod

Install the camera and then adjust it in the desired direction so that the camera can take thermal images of the people who move.

If necessary, install the warning lamp on the tri-pod, too.

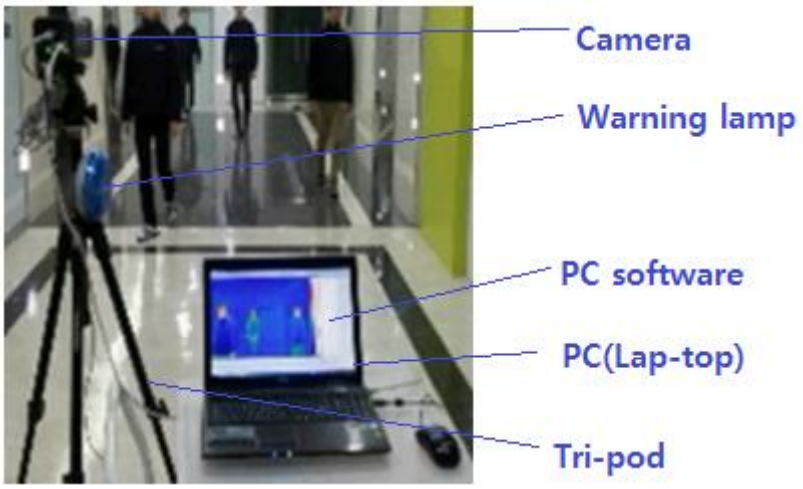
6) Accessories

a) Power adaptor for the camera: 110/220VAC to 12VDC (total length: 2.5m)

b) Ethernet cable: Connect the camera to the PC (total length: 2m)

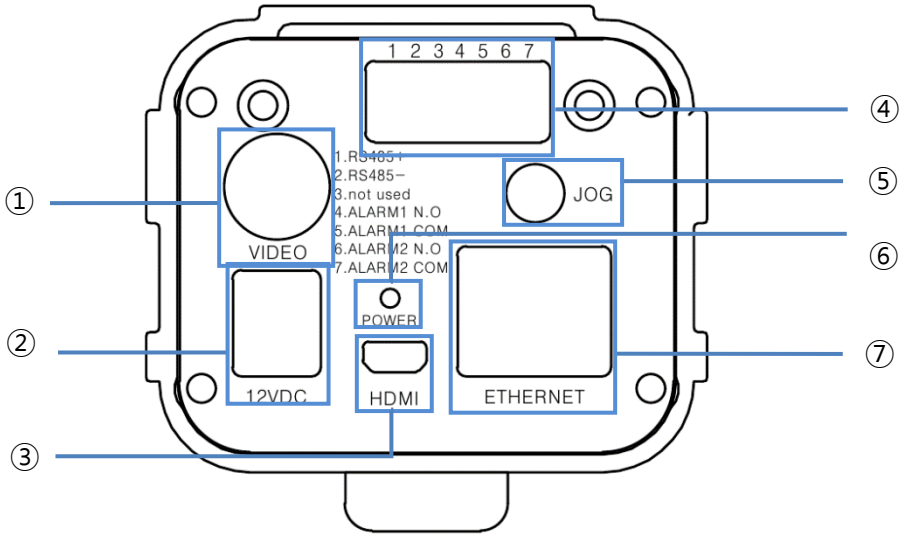
c) CD

The CD contains the user manual of the camera and the user manual of the PC software.



4. Alarm configuration

Camera rear interface



① CVBS (composite video) output (BNC port)

② 12 VDC power in

③ Micro HDM port

④ Digital I/O port

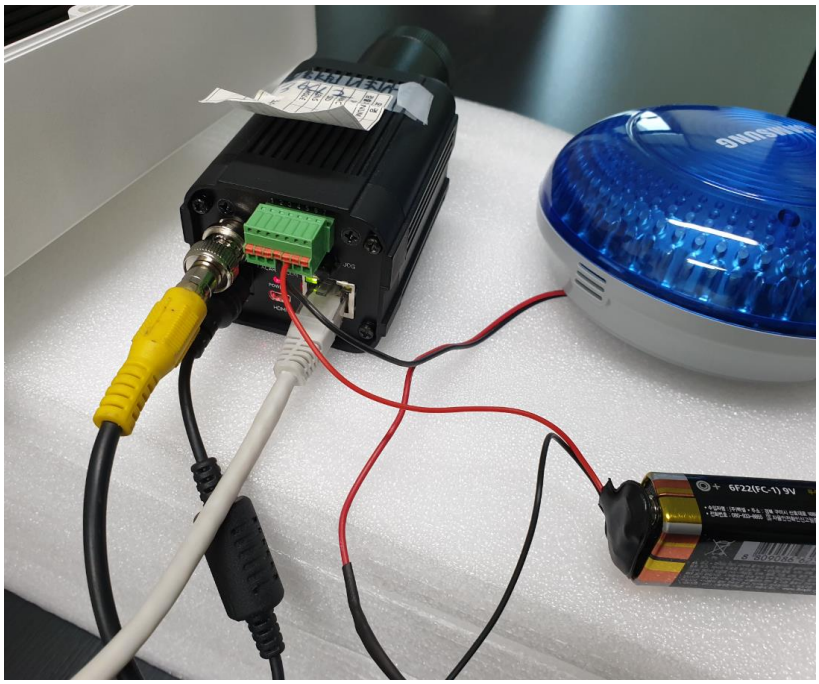
1	2	3	4	5	6	7
RS-485		N/A	ALARM 1		ALARM 2	
RS-485+	RS-485-		SW1 NO	SW1 COM	SW2 NO	SW2 COM

⑤ Jog switch

⑥ POWER LED

⑦ RJ45 port

Cabling for warning lamp (from power and to alarm output relay)



User must provide power to warning lamp separately or other device which will be operated when camera outputs alarm signal, as shown in the picture on the left.

Cabling must be done as shown in the captured image on the left.
Digital I/O port of #4 and #5 play a role of switch. That is, when camera outputs alarm signal, digital I/O port of #4 and #5 is connected and power supply to the warning lamp is completed and warning lamp flashes.

Specification of digital I/O port(relay)

1) Max. Voltage: 250V
2) Max. Current:
   a) AC+DC: 200mA
   b) DC only: 350mA
3) General practice: Normally, engineers in power field use voltage and current under 50% of rating.

5. Thermal camera fever detection demonstration video

This is a demonstration video that shows how to identify people with higher facial temperature than others, while people on the walk using a thermal camera.

When you play the video, you'll see a video taken by mobile phone camera on the right and video taken by the CG320 thermal camera on the right, and the warning lamp will flash when a person with much higher facial temperature pass by the camera.

Video taken by mobile phone camera

Thermal video taken by CG320 thermal camera

If a quarantine officer sits in front of a laptop PC and looks at a CG320 camera's thermal video, he or she can recognize which person's face temperature is higher than others.

In addition, we can make the preset wave file play, record the image or make the border of thermal image may flash red, if the face temperature of a person is higher than the set temperature, if we set in the thermal imaging analyzer or quad channel analyzer.

Of course, you can set thermal imaging analyzer or quad channel analyzer to record corresponding thermal images or temperature data at this moment.

<link> Demonstration video

Google drive link to download video sample and other technical document:
https://drive.google.com/open?id=1cqM2bbI4XZN2XP4u5KEsYTHNc_3NeTjm