FREQUENTLY ASKED QUESTIONS

THERMAL IMAGING FOR ELEVATED SKIN TEMPERATURE SCREENING

FLIR thermal imaging cameras can be a useful, efficient tool for screening people for signs of elevated skin temperature.

Unfortunately, not every thermal camera is appropriate to this application. Obtaining actionable data requires adequate thermal resolution, stability, and measurement accuracy, as well as the correct preparation and scanning methodology.

To help clarify the best practices for this non-contact screening option, FLIR offers these answers to **frequently asked questions.**

Q: CAN FLIR PRODUCTS BE USED TO DETECT A VIRUS SUCH AS THE NOVEL CORONAVIRUS (COVID-19)?

A: No, thermal imaging cameras cannot be used to detect or diagnose an infection. However, FLIR thermal cameras are used today in public spaces such as airports and hospitals and by essential services such as manufacturing and shipping as an effective tool for measuring skin surface temperature. People who are identified as having an elevated skin temperature can then be screened by medical professionals using additional tools such as an oral thermometer.

Q: HOW DOES THERMAL IMAGING TECHNOLOGY WORK?

A: FLIR thermal cameras detect heat radiation and can be used to identify the surface temperature of objects and people. With this capability, FLIR thermal cameras are commonly used as a non-contact screening tool to detect differences in skin surface temperatures and pattern changes. In fact, FLIR is registered with the U.S. Food and Drug Administration (FDA) to provide a variety of its thermal products to screen for elevated skin temperatures in connection with additional screening tools.

Q: HOW SHOULD SKIN TEMPERATURE SCREENING BE PERFORMED?

A: The U.S. Food and Drug Administration (FDA) provides full recommendations for Thermal Imaging Systems (Infrared Thermographic Systems / Thermal Imaging Cameras). Here are several tips to ensure optimal measurement performance from a FLIR thermal camera:

- Screen people one at a time to look for temperature anomalies.
- Screen people from 1 to 2 meters (3 to 6 feet) away.

Measure temperature near the tear duct (at the inner canthus) as this location provides the closest temperature correlation to human core body temperature. This is not measuring core body temperature and readings near 35°C (95°F) are common.

Perform secondary screening on individuals with elevated skin temperature using a medical device designed specifically for measuring body temperature, such as a thermometer.

Q: HOW CLOSE DO YOU NEED TO BE TO DETECT SOMEONE WITH AN ELEVATED TEMPERATURE?

A: In order to obtain a good temperature reading, it is recommended that the intended target be as close to the camera as possible (with respect to the camera's minimum focus distance). The location of the camera may require a different lens. For instance, if the operator wanted to place the camera at a significant distance, FLIR may recommend a telephoto lens. Therefore, distance to the target is an important consideration, as is focus.

It is important that the application be set up so that all intended targets are in focus during the screening process, thereby creating a good image. In addition to focus, a good image is dependent on several additional functions and settings, with certain functions and settings affecting the image more than others. Functions and settings that the operator needs to set and/or adjust include the following:

- Adjust the infrared camera focus
- Adjust the infrared image (automatically or manually)
- Select a suitable temperature range
- Select a suitable color palette
- Change the measurement parameters
- Perform a non-uniformity correction (NUC)

For the FLIR non-contact thermometer (see section below regarding non-contact thermometers), the optimal measurement distance of 5 cm to 15 cm (1.9 in to 5.9 in)

Q: WHAT PRODUCTS DOES FLIR SELL FOR ELEVATED SKIN TEMPERATURE SCREENING?

A: The following FLIR thermal cameras and non-contact thermometers below are registered by the US Food and Drug Administration to detect differences in skin surface temperatures:

Handheld Thermal Cameras

FLIR E53, E95, E85, E75, T530, T540, T620, T640, T840, T860, T1020, T1040

Fixed-Mount Thermal Cameras

FLIR A320 Tempscreen, A300, A310, A315, A325, A615, A655, and A400/A700 (Advanced Smart Sensor configuration)

IR-Thermometer

Extech IR200

Q: WHAT IS FLIR SCREEN-EST™ MODE?

A: Certain FLIR thermal imaging cameras include Screen-EST™ screening mode as a simplified method for measuring elevated skin temperature. This mode can sound or display an alarm when the camera detects an object or person with an elevated temperature compared against a sampled average temperature value. If the screening mode detects an individual with elevated skin temperature, they can then be evaluated using a medical device such as a thermometer. In this way, FLIR Screen-EST provides a faster, safer method of screening people in high-traffic areas. Screening mode is not an absolute temperature measurement and does not require a reference black body or any additional equipment. Screen-EST screening mode does not require capturing, saving, or transmitting any personally identifiable information (PII).

Screening data has shown that skin temperature can vary by as much as several degrees throughout the day depending on environmental and other factors. That's why FLIR Screen-EST mode uses temperatures from ten human subjects to determine an average that can be updated periodically throughout the screening operation. This can reduce the impact of changing skin temperature from person to person

and environment to environment, maximizing elevated skin temperature screening accuracy. As screening mode is not an absolute temperature measurement, it does not require a reference black body or any additional equipment.

FLIR cameras that offer screening mode are highly stable at room temperature, which makes them well suited for this application. Cameras that offer FLIR Screen-EST mode include: FLIR E53, E95, E85, E75, T530, T540, T620, T640, T840, T860, T1020, T1040, A320 Tempscreen.

Q: HOW DOES FLIR SCREEN-EST™ MODE WORK?

A: Screening mode has been available for many years and this description includes the updates and interface for V6.14.66 and later.

Activating the screening mode will turn on a measurement box and screening data on the camera's screen that includes:

- Sampled Average Temperature
- Alarm Temperature
- Measured Temperature

Screening mode automatically prompts the operator to input (press "P" button) the skin temperature from ten people at the testing location to set the Sampled Average Temperature to begin screening. The operator then sets an Alarm Temperature by selecting the appropriate number of degrees above the average. Typically, users choose to set the Alarm Temperature between 1°C to 2°C (1.8°F to 3.6°F) greater than the Sampled Average Temperature. Each person is then screened individually, and their Measured Temperature is compared against the Alarm Temperature.

Throughout the screening period, screening mode will automatically prompt the operator to input (press "P" button) additional subjects for the sampled average. Doing this helps the screening mode account for many potential variations throughout the day, including fluctuations in the average person's temperature due to natural environmental changes, like afternoon heat on a sunny day. In fact, Screen-EST mode reduces the need for absolute accuracy and even self-calibrates to remove potential errors in absolute accuracy from camera to camera.

Q: HOW ACCURATE ARE THE THERMAL CAMERAS?

A: FLIR thermal cameras "see" or detect the temperature differences with temperature measurements between -20°C and 2,000°C (-4°F to 3,632°F). The standard FLIR product accuracy specification of ±2°C or 2% of the temperature reading at 30°C (86°F) ambient environment applies to all temperature ranges it measures and for the multiple applications for which it can be used.

FLIR thermal camera with screening mode can achieve accuracies of ±0.3°C (0.5°F) at the recommended ambient temperate of 30°C to 45°C (86°F to 113°F).

It's important to note there are many factors that can affect the accuracy of thermal cameras, such as focus, distance, the emissivity* of the target, the ambient environment, and the speed at which the temperatures are acquired.

*A target's emissivity is its ability to emit thermal radiation. For example, ceramic mugs, clothing, and even human skin have high emissivity, while polished metals have low emissivity.

Q: HOW ACCURATE ARE FLIR THERMAL CAMERAS IN SCREEN-EST MODE?

A: FLIR thermal cameras with screening mode can achieve accuracies of ±0.3°C. This meets the U.S. FDA Guidance for Industry and Food and Drug Administration Staff and ISO/TR 13154 specification. High accuracy can be achieved by using the camera in a stable ambient environment, only looking at humans, and updating the reference samples according to the population being screened.

Q: DO I NEED TO USE A BLACK BODY FOR ELEVATED SKIN TEMPERATURE SCREENING?

A: There are advantages and disadvantages to using a black body when screening for elevated skin temperatures. Including a black body in the camera's field of view can improve the system's performance in this application. You can use FLIR thermal cameras with black bodies as part of an elevated skin temperature system setup. In fact, many of our integrators and partners are doing just that, taking FLIR technology and developing their own software solution that uses a black body as the reference.

The new A4xx/A7xx Thermal Smart Sensor cameras support the use of a black body reference out of the box. To do so, simply turn on the black body reference in the camera control interface and place the cursor on the black body reference. The A4xx/A7xx Smart Cameras with elevated skin temperature configuration also have on camera screening mode, and in that configuration, do not require a black body.

FLIR Screen-EST mode does not require the use of a black body. The handheld versions of these products are all inclusive, minimizing points of failure and maximizing flexibility and mobility. Screening mode also helps account for many potential variations during screening throughout the day, including fluctuations in an individual's temperature due to natural environmental changes. Screening mode reduces variations in absolute accuracy throughout the day and even accounts for any potential variation in absolute accuracy from camera to camera.

In contrast, using a black body for elevated skin temperature screenings can create challenges. The first is the cost and complexity of including an additional piece of hardware in the solution. Black body integration into a system makes mounting, powering, and ultimately maintaining it more complex. Such an addition also introduces another potential point of failure into the overall solution.

Proper focus on the black body is essential to getting accurate measurements. For a black body to be effective, it must be mounted in the same plane as the person being screened. A black body that is significantly closer or farther than the person being screened will be out of focus and not function as an accurate reference source.

If ultimately the screening solution includes the use of a black body, FLIR recommends following these requirements, as set forth in ISO/TR 13154:2017:

- The camera of the screening thermograph should be positioned perpendicular, both horizontally and vertically, to the face of the individual being screened so that the inner corner of both eyes can be imaged simultaneously.
- The individual being screened and the external temperature reference source should be in the correct position and orientation relative to the camera for proper focal distance, depth of field and image capture. There should be a means of ensuring that the individual being screened is in this proper position, e.g. a stool, marks on the floor. Consideration should be given to individuals in wheelchairs.
- The backdrop behind the individual being screened and, when used, side screens should be thermally uniform, high emissivity (non-reflective in the IR spectrum) and light in color (visible spectrum).
- The operator should be positioned with a clear visual field of the individual being screened and the display of the screening thermograph. The operator may need to intervene to correct the individual's position. The operator should also be positioned in such a way as to divert individuals to the secondary screening area when required.
- Operators should be assessed as to their ability to discern the colors of the rainbow scale of the screening thermograph.

Q: DO PEOPLE USING YOUR CAMERAS NEED TO BE CERTIFIED/TRAINED TO UNDERSTAND HOW TO INTERPRET THE IMAGES AND DATA?

A: FLIR recommends that thermal camera operators obtain at a minimum Level 1 thermal imaging certification through certified thermography courses such as the Infrared Training Center. This is not a medical training or medical certification, but it provides a baseline understanding in thermography. The Infrared Training Center offers more advanced training.

Q: CAN YOU NAME SOME COMPANIES, ORGANIZATIONS, AND AIRPORTS THAT HAVE PURCHASED YOUR PRODUCTS?

A: While we cannot name specific customers or comment on current sales, we can say that our thermal cameras are used by customers at ports of entries and high-traffic locations in several countries, including the US, China, Hong Kong, Taiwan, Singapore, South Korea, Thailand, Philippines, and Malaysia.

Q: HOW LONG HAS FLIR BEEN SELLING THERMAL CAMERAS AND NON-CONTACT THERMOMETERS FOR ELEVATED SKIN TEMPERATURE SCREENING?

A: FLIR noted an increase in the use of thermal cameras for skin temperature screening during the SARS outbreak in 2003.

Q: HOW DO YOU USE NON-CONTACT THERMOMETERS FOR ELEVATED SKIN TEMPERATURE SCREENING?

A: FLIR sells an IR non-contact handheld thermometer under our Extech brand, the IR200. Non-contact thermometers are primarily used in a handheld fashion to screen a person's forehead. The operator points the non-contact device at the subject from a recommended distance of 5 cm to 15 cm (1.9 in to 5.9 in); the thermometer can measure temperatures from 32°C to 42.5°C (89.6°F to 108.5°F).

Q: WHAT ARE THE MINIMUM SPECIFICATIONS FOR THE NON-CONTACT THERMOMETER?

A: Requirements for a non-contact thermometer include:

- Non-contact infrared thermometer/gun type - human body measurement
- Product must be CE marked or USFDA 510k
- Product must be produced in accordance to ISO 13485 or equivalent
- Production must be in accordance to EU standards, ISO 9001 or equivalent

For FLIR non-contact thermometers, an adjustable alarm alerts the user—either visually or audibly—when the temperature exceeds the programmed limit. The non-contact thermometer has a large backlit LCD display to display temperatures.

The recommended FLIR non-contact thermometer has been calibrated to an accuracy to 0.3°C (0.5°F) with 0.1°C/°F resolution.

Q: WHAT IS THE EXTECH IR200, AND HOW DOES THE IR200 COMPARE TO OTHER FLIR ELEVATED SKIN TEMPERATURE SCREENING OFFERINGS?

A: The Extech IR200 is an entry level product offering in our elevated skin temperature screening portfolio. The IR200 is a lower cost, non-contact skin measurement tool for front line elevated skin temperature screening applications. But like other forehead IR thermometers, it does not have the same advantages as one of FLIR Screen-EST enabled thermal camera solutions. With built-in camera stability control,

automatic temperature measurement at greater standoff distances without operator input, and the ability to screen the entire face pinpointing the inner canthus area near the tear duct, FLIR thermal cameras designed for elevated skin temperature screening provide a much higher performance approach to screening for elevated skin temperature.

Q: HOW ACCURATE IS THE IR200?

A: The IR200 utilizes a spot pyrometer-based non-contact temperature measuring technology and is accurate to 0.3°C (0.5°F) with 0.1°C/°F resolution when measuring skin temperatures between 32.0°C to 42.5°C (89.6°F to 108.5°F). Additional information can be found at Extech.com.

When properly used, it can be an effective tool to help detect whether someone may have an elevated temperature and should be subject to further screening.

Q: HOW IS THE IR200 MANUFACTURED AND CALIBRATED?

A: During production inspection, each IR200's object mode is calibrated with multiple known temperature targets and is then programmed with an offset to translate to body mode. The IR200 calibration can also be adjusted by the user per the owner's manual.

Q: HOW SHOULD THE IR200 BE USED IN ELEVATED SKIN TEMPERATURE SCREENING SYSTEMS?

A: Unlike many of the non-contact IR thermometers being promoted by other companies, FLIR promotes the IR200 only as an initial screening tool, and not a medical grade thermometer capable of giving a user an accurate reading of an individual's core body temperature. This guidance is also listed on the Extech IR200 web page, as shown here:

This thermometer is intended for screening individuals or monitoring an individual for potential elevated skin temperatures. It is not a substitute for a clinical thermometer. Always use a clinical thermometer when high accuracy body temperature measurements are required.