“Short” BEST PRACTICE GUIDE

USE OF THERMAL IMAGERS TO PERFORM TRACEABLE NON-CONTACT SCREENING OF HUMAN BODY TEMPERATURE

Based on the CCT-TG-BTM best practice guide: “Use of thermal imagers to perform traceable non-contact screening of human body temperature”

4th version: 3 March 2022

1. Purpose

To aid, clinicians, healthcare officials and other stakeholders to obtain the best performance for determining human body temperature from screening with thermal imagers, including an estimate of the likely overall uncertainty[1].

2. Thermal imager indicated temperature versus human core body temperature

The temperature of the facial area (for example the forehead) can significantly depart from core body temperature depending on environmental conditions and skin perfusion for example. As such, thermal imagers should only be used in a well controlled environment and are very likely only to achieve the uncertainty specified below. There is some evidence to suggest that the inner canthus is the best target on the face to perform body temperature measurement; this is currently being investigated.

3. Influence factors

To obtain the best performance when determining body temperature using thermal imaging, individual person temperature screening is preferable, and the following items should be considered:

Minimum target size/measurement distance: It is very important that enough pixels (240x180)[2] are covering the measurement target (ROI-region of interest).
Measurement target: The region of interest being measured *must be clear* of all obstructions – e.g., hair, head covering, masks, eyeglasses and sweat free.
Ambient conditions: The thermal imager must be operated within specified ambient conditions given by the manufacturer. Use outside of those conditions could result in significant errors. Moreover, the temperature of the forehead or other skin could be severely affected by ambient conditions (for example heater or solar radiation, wind, or air conditioning, etc).
Reflected radiation: Nearby hotter or colder objects might influence the thermal radiation measured by the thermal imager. Precautions (for example by blocking with barriers) must be taken to avoid the reflected thermal radiation from such objects leading to erroneous temperature readings.
Background radiation (temperature): This is the diffuse thermal radiation present in the environment because of the ambient temperature. Thermal imagers compensate for this either automatically by measuring the ambient temperature or by the user entering its value into the thermal imager software.
Measurement time: Time necessary to perform a reliable measurement with the thermal imager (essentially this is the acclimatization time of the person being measured). For reliable thermometry the person **must** be allowed to acclimatise (typically 10–15 min) to the ambient conditions before their temperature is taken.
Drift: The thermal imager accuracy will degrade over time. To correct for this, the device requires periodic and traceable calibration. The device calibration status should be clearly indicated.

[1] This document is a summary of the key findings of: "CCT-TG-BTM best practice guide: Use of thermal imagers to perform traceable non-contact screening of human body temperature". This can be downloaded for free from: (bipm.org)

[2] Based on the requirements given in IEC 80601-2-59:2017 Medical electrical equipment — Part 2-59: Particular requirements for the basic safety and essential performance of screening thermographs for human febrile temperature screening

4. Expected accuracy in use

In use, following the manufacturer's instructions and taking the precautions outlined above, **the best achievable expanded uncertainty in the measurement of body temperature would be 0.6 °C (*k* = 2)**.