



FEVER SCREENING SOLUTIONS



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INTRODUCTION

This guide was developed with global expertise and co-created with G4S stakeholders, manufacturers and specialists in the field of fever screening solutions.

The current Coronavirus is not the first virus and it probably won't be the last virus that challenges society and humans. A raised body temperature is one of the easiest ways to detect someone with a virus. Viruses can often spread quickly through humans and it is important for people to follow the advice from the World Health Organisation (WHO) regarding best practices for avoiding the spread. Unfortunately, for various reasons, some members of our society do not comply with the general suggestions from WHO and other authorities and in many cases end up becoming a risk to their fellow citizens. It is our duty to minimise that risk and protect our immediate environment against these threatful events.

Detecting Risk is the first step in our Risk Analysis methodology. Identifying a potential disease carrier via a human temperature reading early on, via a human temperature reading, is of utmost importance. There will always be cases of infected individuals (especially in the 'incubation stage') that would not necessarily show an increased body temperature. Likewise an individual that has passed the peak and their body temperature has returned to normal may still be infectious. Individuals may also have suppressed their elevated body temperatures with medication such as aspirin or paracetamol.

The least intrusive method to identify potential disease carriers in free flowing public areas is through body temperature readings. Whilst a high body temperature reading does not necessarily confirm a disease carrier in 100% of the instances, it does however give a good indication. A raised body temperature provides grounds to address the individual, and to manage the incident professionally, thereby minimising the damage.

One important piece of general advice is to avoid close distances between possible virus and disease carriers. This is where fever screening solutions come into place as they have the capability to detect the possible disease carrier from a distance of up to 3 to 5 metres, even within large groups. Carrying out the temperature measurement needs to be carefully looked at, because in some countries the law states that only medical professionals can perform tasks such as temperature measurement. Another important consideration is how to handle the situation if someone is actually identified.

This guide will answer these questions and other important considerations.

In general, it is important to be aware that the technology and processes around Fever Screening Solutions are comparable to Alcohol, Medicine and Drug Screening Solutions. There are many specific solutions available to screening temperature but most

of them are limited since they are not an end-to-end solution – one that takes care of the whole process from detecting, to delaying and responding.

We have developed a concept – ‘Integrated Fever Screening Solutions’ which takes all possible situations into consideration.



An example of a level three integrated permanent fever screening solution in a megastore.

THE FUNDAMENTALS

The fundamentals in radiation and temperature measurement is that the temperature of all materials is higher than absolute zero (- 273.15°C) and everything radiates through electromagnetic waves continuously. This is important because the thermal imaging camera collects the infrared radiation energy emitted by the measured objects, and establishes the accurate corresponding relationship between the target energy and temperature through a complex temperature measurement algorithm. On top of this, the thermal imaging camera in combination with a 'Blackbody' (see note 1) temperature measurement calibration unit and other processes make it possible to measure temperature of the human body in distances of up to 3 to 5 metres with high accuracy.

A normal forehead / face temperature measurement, depending on different environments, is about 31-36°C (see note 2). As the skin surface of the forehead and face is exposed to the air, the temperature changes due to the influence of air flow and sweat (see note 3). Generally, under the indoor ambient temperature of 15°C in winter, if the forehead temperature exceeds 35°C, there is a possibility of fever (the measurement is lower than the average body temperature due to the influence from the outside temperature). For other environmental temperature conditions, it is recommended to measure several samples on site, and if it increases by 1°C, use this as the alarm threshold on the basis of a normal forehead temperature.

The human body temperature measurement from longer distances requires high precision. With the optimal solution, installation, environment and continuous calibration the precision can be up to $\pm 0.3^{\circ}\text{C}$.

The accuracy of the provided/read temperature is greatly improved if the system is deployed within an appropriate environment. People flow and corralling adds to the accuracy, which ties to the environment the system is deployed in.



RISK ANALYSIS

Current advice and best practice is to stop the spread of the virus by keeping distance from possible carriers, and preventing carriers from coming into contact with other humans. Therefore, fever screening solutions must be done at a distance. It is essential to detect a possible carrier as early as possible with as high a precision as possible.

At the same time, the principle effects of fever measurement are simple – the shorter the distance to the human body, the more precise a measurement is. The most precise measurements are those taken on, or inside, the body, but the shorter the distance, the higher the risk for contamination and the spread of the virus.

The purpose of an Integrated Fever Screening Solution is to prevent any possible carrier from transferring the virus. There are several functions that the Integrated Fever Screening Solution must perform. The primary functions are Detect, Delay and Response. It is important to note that detection must be accomplished for delay to be effective.

The solution's goal is to protect from contamination. For the solution to be effective at this objective there must be an awareness that there is a possible virus carrier (detection) and then a reject, slowing or isolation of the possible virus carrier (delay), thus allowing the response force enough time to interrupt or stop the possible virus carrier from entering and connecting with other humans (respond).

DETECT

Detection is the discovery of a possible virus carrier.

The precision of the temperature measurement is of high importance – no-one wants to be told they have a high fever, and are therefore a possible virus carrier, and it is even worse when the identification is in a public area.

The higher the precision of the measurement, the less unpleasantness, discomfort and inconvenience – simply because the risk of being incorrectly identified is reduced significantly. The detection of a fever is preferably done by distance (to keep as far away from the possible virus carrier) and with as much speed as possible (to maximise the number of people being checked). However, conducting temperature checks at a longer distance and higher speed is a more expensive solution.

The detection function is also entry control. Entry control refers to allowing entry to authorised personnel and detecting the entry of unauthorised personnel and material. In Integrated Fever Screening, the solution detects the possible virus carrier and then automatically, manually or personally gives or denies access.

DELAY

Delay is the second function of an Integrated Fever Screening Solution. Delay can be accomplished by personnel, barriers, speed gates, shutter doors, locks and activated delays for example.

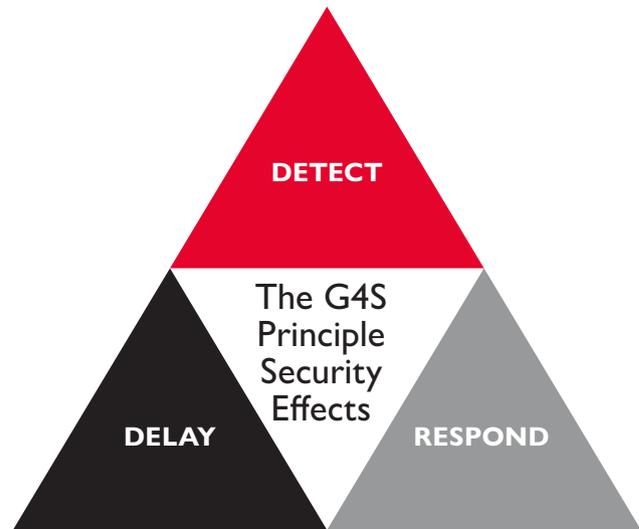
Preferably the 'delay' is done automatically by a physical barrier – this is preferred to keep the longest possible distance to the possible virus carrier. On the other hand a security personnel intervention is more human and service orientated. The optimal solution is a combination of technology with intervention from educated security personnel.

The preferred delay solution depends on various factors, such as the number of people accessing and entering, risk level and the budget.

RESPOND

The response function consists of the actions taken by the response force (security personnel) to prevent the possible virus carrier access and/or recovery back to normal operations after a contamination.

Depending on the precision of the fever screening solution, and the risk level, another step in the screening process can be the use of an ear temperature gun or a mercury thermometer to further confirm. However, this reduces the distance even further between the possible virus carrier and the security personnel.



Ideally, the detection and measurement is done with such a high precision in combination with an effective delay and response function that the Integrated Fever Screening Solution has as little influence as possible on everyday tasks from all parties.

THE SOLUTIONS

There are several scenarios and concepts to be considered. The 'right' solution is specific to each customer's unique needs and demands. There are three solutions:

LEVEL ONE **HANDHELD FEVER** **SCREENING SOLUTIONS**

The handheld solution is where an operator measures the temperature of a person walking in a pre-designated screening area. There are generally two types of handheld units available: Forehead thermometer and Handheld thermographic camera.

Forehead thermometer is a measuring unit for accurate temperature measurement from a close range of 0.3 metres. The measurement procedure takes a few seconds and can screen 12 people per minute.

Handheld cameras can be operated from a distance of 1,5 metres, and have a wider view. It can take several measurements at the same time, and gives the forehead temperature of a person in real time. It can screen less than 60 people per minute.

LEVEL TWO **INTEGRATED MOBILE** **FEVER SCREENING** **SOLUTIONS**

The semi-automatic solution allows a system to automatically measure the temperature of a person walking in a pre-designated screening area (maximum distance 3 to 5 metres x width 1.4 metres). The area needs to be defined and clearly marked with pullout safety barriers and/or similar apparel.

With this solution, installation, environment and continuous calibration the precision can be up to $\pm 0.3^{\circ}\text{C}$ (in combination with the Blackbody calibration unit).

This solution can take a capacity of up to 30 people sequentially and, if deployed appropriately will have minimal impact on people flow.

When identifying a possible virus carrier, the system gives an alarm (light, sound and/or signal to a remote monitoring room). The

LEVEL THREE **INTEGRATED PERMANENT** **FEVER SCREENING** **SOLUTIONS**

The full integrated solutions includes either training of security personnel or outsourced to G4S security personnel services.

The fully automatic solution allows a system to automatically measure the temperature of a person walking in a pre-designated screening area (maximum distance 3 to 5 metres x width 1.4 metres). The area needs to be defined and clearly marked with pullout safety barriers and similar.

With this solution, installation, environment and continuous calibration the precision can be up to $\pm 0.3^{\circ}\text{C}$ (in combination with the Blackbody calibration unit).

This solution can take a capacity of up to 30+ persons sequentially and, if deployed appropriately will have almost no impact on people flow.

LEVEL ONE (CONTINUED)

The handheld can be placed on a tripod stand but that decreases the quality of measurement (because of increased distance) and is not recommended with the current technology.

When identifying a possible virus carrier, the device gives an alarm. The security personnel can then isolate the person for additional testing or ask the person to leave.

The handhelds are battery powered devices and need to be charged every 4 to 5 hours.

LEVEL TWO (CONTINUED)

Security Personnel approaches, whilst maintaining a safe distance, and isolates the person for additional testing or asks the person to leave.

The technology that forms part of the integrated mobile solution is the thermal camera and Blackbody calibration unit – both on tripod stands which are portable and supported by software. All delivered in one package – ready to go (pullout safety barriers not included as standard).

LEVEL THREE (CONTINUED)

When identifying a possible virus carrier, the system will give a signal to door shutters, speed gate or similar apparel to lock the door and ensure that the possible virus carrier can't enter. In addition the system outputs an alarm (light, sound and/or signal to a remote monitoring room).

The possible virus carrier is isolated and transferred to a screening area for additional testing by security personnel. Depending on the result, the individual may be asked to leave.

The technology that forms part of the integrated permanent solution is the thermal camera and Blackbody calibration unit – both with fixed installation, cables, hardware and software (pullout safety barriers not included as standard).

The full integrated solutions includes either training of security personnel or outsourced to G4S security personnel services.

LEVEL ONE
HANDHELD FEVER
SCREENING SOLUTIONS

LEVEL TWO
INTEGRATED MOBILE
FEVER SCREENING
SOLUTIONS

LEVEL THREE
INTEGRATED PERMANENT
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SOLUTIONS

OPERATOR

The operator can be employed by the end-user or outsourced to G4S through our security personnel services.

The operators are exposed to risk because of the reduced distance to the possible virus carrier.

The operator can be the end-user or for example a G4S Security Personnel.

The operator is less exposed to risk because of the further distance between them and the possible virus carrier

The operator can be the end-user or, for example a G4S Security Personnel.

The operator is even less exposed to risk because of the further distance between them and the possible virus carrier.

EDUCATION

The operators are advised to wear personal protective equipment (PPE). Depending on the Fever Screening solution, you need to ensure that the right protective gear is used to protect staff, visitors and others.

The operator needs to be educated in the technology, the process and regulations and to have a clear understanding of what to do when identifying a possible virus carrier.

The security personnel needs to have authority when situations escalate.

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BENEFITS

- Easy to implement.
- Mobile and modular.
- Familiar procedure used for weapon/metal detection and similar.

- Mobile and modular solution that can be moved to other premises.
- Can handle a large number of people and is continuously active.

- Can handle a large number of people and is continuously active.
- The best preventive solution with the least human interaction and risk.

CONSIDERATIONS

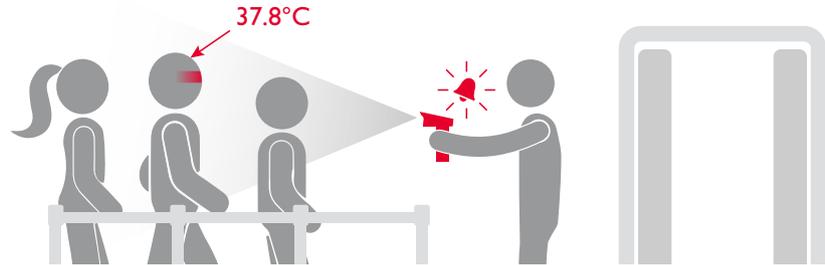
- Only used with a reduced amount of people.
- The handhelds are battery powered devices and need to be charged every 4 to 5 hours.
- Close contact (small distance) with the possible virus carrier.
- Less precise because not partnered with the Blackbody calibration unit ($\pm 1.0^{\circ}$ C).
- No face mask detection.

- The solution can be upgraded to level three later.
- Easy installation/integration with light, sound and/or signal etc.
- It is a mobile installation on tripods and therefore there is a risk that someone could push one of the tripods and then the system needs to be readjusted/reconfigured.

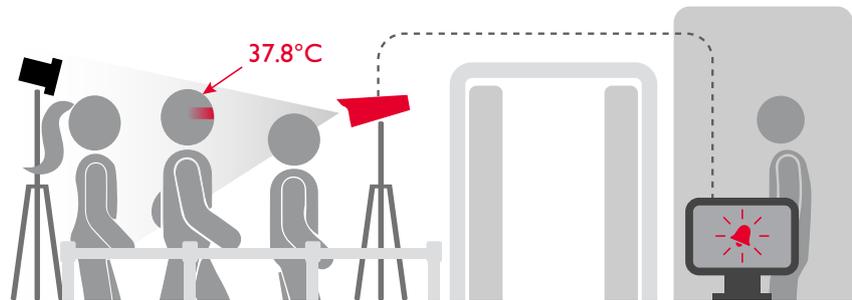
- Requires a professional installation and integration to existing entry solutions.
- It is a fixed, permanent solution.
- There needs to be a test zone in the entrance.

The three different solutions are illustrated below, based on a supermarket entrance. These solutions can all be tailored to individual customers and their own profile or situation.

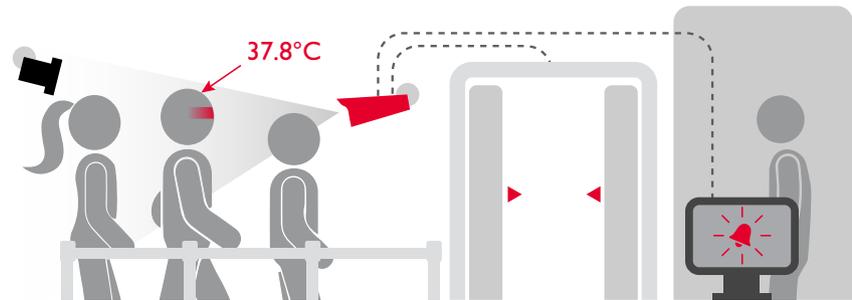
LEVEL ONE
HANDHELD FEVER
SCREENING SOLUTIONS



LEVEL TWO
INTEGRATED MOBILE
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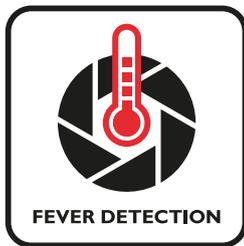
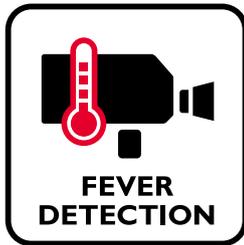


LEVEL THREE
INTEGRATED
PERMANENT FEVER
SCREENING SOLUTIONS



PICTOGRAMS

Two different pictograms illustrating 'Fever Detection' can be used in connection with the installation of any of the Fever Screening Solutions to inform visitors, travellers, customers etc. that there will be fever screening performed.



CONCLUSION

The three different solutions differ in price and complexity. The two Integrated Fever Screening Solutions are the highest level of safety.

The following considerations should all be addressed as a minimum

1. All solutions require a partnership with suppliers to ensure a professional experience.
2. All solutions require clear strategies and procedures.
3. All solutions need clear communication with illustrations to customers, guests and visitors – similar to the communication in airports and when performing Alcohol, Medicine and Drug Screening Solutions.
4. All solutions require an investment in technology and resources.
5. All solutions can be purchased, leased or financed as a complete Integrated Fever Screening Solution.

The **Level Two** Integrated Mobile Fever Screening Solution is recommended when the risk is significantly high. The **Level Three** Integrated Permanent Solution is the right solution in the long term but Level Two can be upgraded at a later stage.

The **Level One** Handheld Fever Screening Solution provides a basic, minimum solution for temperature checks. Used properly, and with the right education and training, it is a viable solution however we only recommend this option when there are a limited number of people who need access.

Depending on the risk level, the precision of this solution requires another step in the screening process – the use of an ear temperature gun or mercury thermometer. However, this reduces the distance even further between the possible virus carrier and the security personnel.

Our recommendation is to avoid the use of ear temperature guns or mercury thermometers in 'normal' environments and preferably deny access to the possible risk carrier without further measurements.

All solutions can be installed in existing environments.

Our Level Three solution is the most complex but also adds significant value because it can cover larger areas and more people. All solutions require training and education.

As mentioned, the best solution is a fully Integrated Fever Screening Solution incorporating;

- Risk Consulting and Management
- Mobile Security Professionals
- On-site Security Professionals
- Enhanced Security Professionals
- Security Operation Centres
- Mechanical Security
- Physical Security Information Management (PSIM)
- Access Control Systems
- Video Monitoring Systems

The combination of these elements together adds more value than the value of each element alone.

NOTES

NOTE 1 – BLACKBODY CALIBRATION UNIT

The Blackbody calibration unit is used to help gage a constant temperature reference source. When testing human body temperature, the blackbody calibration unit is generally set at 35°C, which is used for temperature correction of thermal imaging acquisition, so as to meet the accuracy requirements of $\pm 0.3^{\circ}\text{C}$. It doesn't need to be connected to the camera, it's a separate piece of technology. After power has been switched on, it can be placed in the camera screen according to the installation instructions.

NOTE 2 – FRONTAL FOREHEAD

First of all, different people's forehead temperatures also have a temperature difference. In the case of masks, the exposed area of the forehead is relatively large, which is more convenient for temperature measurement. The actual temperature of the front face and the side face of the same person / same position is different. With masks, the high temperature points are mainly in the forehead, ears and neck, and the temperature is different among different people.

NOTE 3 – INSTALLATION

Outdoor temperature, wind, humidity and other environmental factors have a great impact on the temperature measurement of the thermal imaging surface, so it is not recommended to have the technology installed outdoors or in the area directly connected to the outdoors, but in a closed and relatively stable environment without wind.

The best temperature range of indoor, wind free and stable environments is $10^{\circ}\text{C} \sim 30^{\circ}\text{C}$. The best temperature measurement distance is the same as the distance between the blackbody calibration unit and equipment. There is no limit to the number of people in the detection area, but if it is too large or there is overlap it will result in missing or inaccurate temperature measurement.

Site tests that we have carried out with the Level Two Integrated Mobile Solution proves that you can effectively test multiple individuals one after the other, it is however important to create the correct 'channelled' environment obviously keeping the appropriate social distance.

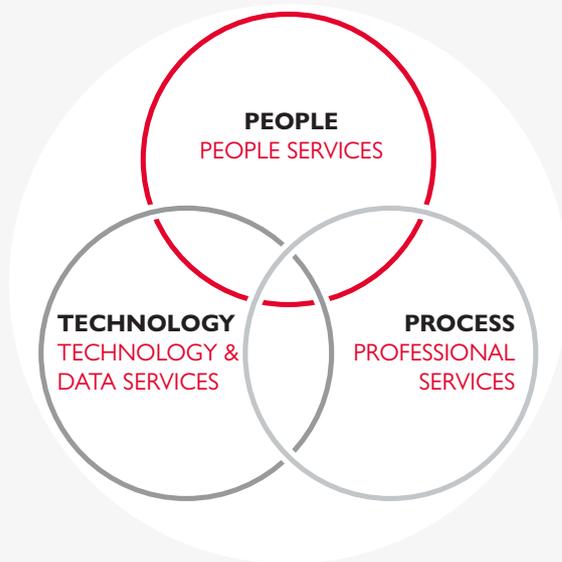
POSTSCRIPT

This guide was written by Steen Bonke Sørensen as the primary subject manager expert with co-creation from the G4S Academy Specialists from Austria, Belgium, Denmark, Estonia, Netherlands, United Kingdom, United States, among others.

G4S

Our purpose is to create sustainable value by delivering industry-leading, technology-enabled security solutions and outstanding service for our customers.

Our integrated offering combines the best security professionals with cutting-edge technology and data analytics.



We operate in around 85+ countries around the world with 558,000 employees, providing our customers with unmatched global coverage.



THE G4S ACADEMY

The G4S Academy is a platform within G4S that allows us to work more collaboratively with our customers, suppliers, partners and other stakeholders to create knowledge and value together.

The G4S Academy's mission is to use our global knowledge and expertise to co-create industry-leading solutions, products and services that will improve how we provide safety, security and business value to our customers.

We define Value as the triple bottom line – environmental value, social value and economic value.

Security and safety has become a fundamental component of business operations. Many of our traditional customers are changing their focus from managing safety and security to fueling business growth. This is one of the biggest challenges that executives in the security industry face today and this is forcing all of us to communicate our value in a completely new way.

Find out more about the G4S Academy at <https://www.g4s.com/what-we-do/g4s-academy>





VALUE CREATED TOGETHER

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