

G4S ACADEMY



INTEGRATED
FEVER SCREENING
SOLUTIONS



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This guide Integrated Fever Screening Solutions is written by Steen Bonke Sørensen (steen.sorensen@g4s.com) as primary subject manager with co-creation from G4S Academy Specialists from Austria, Belgium, Denmark, Estonia, Netherlands, United Kingdom, United States, among others.

Introduction

This guide is 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. One of the easiest ways of detecting a human with a virus is the body temperature. The spread of viruses are often carried from humans and the advice and best practices from WHO – World Health Organization always should be taken into consideration. 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 minimize that risk and protect our immediate environment against these threatful events.

Detecting Risk is the first step in our Risk Analysis methodology and in this case identifying a potential disease carrier via human temperature reading early on is of utmost importance. Many studies of mass blind screening would suggest that fever screening may reduce the spread of infection by up to 50%. 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, non-intrusive, method to identify potential disease carriers in free flowing public areas is through body temperature readings. Although we are aware that high body temperature readings do not necessarily relate to a virus and disease carrier 100% of the instances, it does however give us a good indication and grounds to address the individual prospect and professionally manage the incident and therefore minimizing the damage.

One of the important pieces of general advice is to avoid short 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 meters, even within large groups. One thing is to detect the disease carrier and as an example in some countries it is by law that only medical personnel can perform tasks such as temperature measurement. Another concern is to consider how to handle the situation if someone is identified.

This and similar questions we are seeking to answer in this guide.

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

of them are limited since they are not developed as an end-to-end solution 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 under 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 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 and other processes make it possible to measure temperature of the human body in distances of up to 3 to 5 meters with high accuracy.

Thermal imaging human body temperature measurement, mainly through the measurement of human forehead and face temperature (according to the different environment is about 31-36° C) (see note 2), preliminary judgment, found the suspected abnormal temperature. As the skin surface of 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 increase 1° C as the alarm threshold on the basis of normal forehead temperature.

The human body temperature measurement on distances requires high precision. With the optimal solution, installation, environment and continuously calibration the precision can be up to $\pm 0.3^{\circ}$ 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 accuracy which ties to the environment the system is deployed in.

Risk Analysis

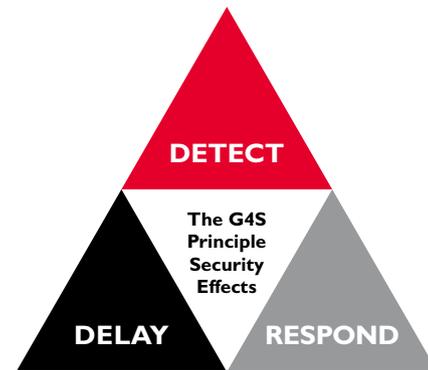
Since one of the overall advice and best practices is to keep distance to the possible carriers, the preferred solution for fever screening solutions is those who can be done at distance. And since we can not at all times avoid being close to each-other as humans, it is of high importance to be able 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 higher a precision measurement is possible. Best is on or inside the body. But the shorter distance – the higher risk for contamination and spread of the virus.

The purpose of an Integrated Fever Screening Solution is to prevent any possible carrier intended or unintended to transfer 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 connect with other humans (respond).



Detect

Detection is the discovery of a possible virus carrier.

The precision of the temperature measurement is of highly importance – it is not at all a 'feel good situation' to be identified with high fever and therefore being a possible virus carrier. It is even worse when the identification is in a public area.

The higher precision of the measurement the less unpleasantness, discomfort and inconvenience – simply because the risk of being identified by mistake is reduced

significantly. The detection of a fever is preferably done on distance (to keep as long a distance to the possible virus carrier) and with as high speed as possible (to keep the amount of passings up to speed). The solution is on the other hand most expensive when being able to measure at a longer distance and higher speed.

The detection function is also entry control. Entry control refers normally to allowing entry to authorised personnel and detecting the attempted entry of unauthorised personnel and material. In the Integrated Fever Screening Solution 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 etc.

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 professional personal intervention is more human and service orientated. The optimal solution is a combination of technology with intervention from educated Safety Personnel.

The preferred delay solution depends on the amount of people accessing and entering, the risk-level and the budget.

Respond

The response function consists of the actions taken by the response force (Safety Personnel) to prevent the possible virus carrier access and/or recovery back to normal operations after an eventual 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 Safety Personnel.

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

The Solutions

There are several solutions and concepts to be considered. The 'right' solution is individual and specific

to unique needs and demands. In general there are three solutions:

	<h2>Level One</h2> <p>Handheld Fever Screening Solutions</p>	<h2>Level Two</h2> <p>Integrated Mobile Fever Screening Solutions</p>	<h2>Level Three</h2> <p>Integrated Permanent Fever Screening Solutions</p>
Description	<p>Handheld solutions where an operator measures the temperature of the person. There are generally two types of handheld units available: Forehead thermometer and Handheld thermographic camera.</p> <p>Forehead thermometer is a measuring unit for accurate temperature measurement from close range ca 0.3 meter. Measurement procedure takes a few seconds. Capacity 12 persons pr. minut.</p> <p>Handheld cameras can be operated from a distance of</p>	<p>Semi automatic solutions where the system automatically measures the temperature of the persons walking in the scanning area (maximum distance 3 to 5 meter x width 1.4 meter). The area needs to be defined and clearly marked with pullout safety barriers and similar.</p> <p>With the optimal solution, installation, environment and continuous calibration the precision can be up to $\pm 0.3^{\circ}\text{C}$ (in combination with Blackbody calibration). Capacity up to 30 persons sequentially and, if</p>	<p>Automatic solutions where the system automatically measures the temperature of the persons walking in the scanning area (maximum distance 3 to 5 meter x width 1.4 meter). The area needs to be defined and clearly marked with pullout safety barriers and similar.</p> <p>With the optimal solution, installation, environment and continuous calibration the precision can be up to $\pm 0.3^{\circ}\text{C}$ (in combination with Blackbody calibration). Capacity up to 30+ persons sequentially and, if deployed appropriately will have</p>

Level One Handheld

ca 1,5 m, have a wider view of field and can take several measurements at the same time. And gives the forehead temperature of persons on the range real time. Capacity 60 persons pr. minut. 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 handheld scanner gives an alarm. The operator (Safety Officer) isolates the person and either tests additional or asks the person to leave.

Access is re-opened.

Level Two Integrated Mobile

deployed appropriately will have minimal impact people flow.

When identifying a possible virus carrier the system gives an alarm (light, sound and/or signal to the remote monitoring room). A Safety Officer approaches and contacts and isolates the person and either tests additional or asks the person to leave.

Access is partly continuously active and open for passage.

The technology part of the integrated mobile solutions are the thermal camera and Blackbody calibration unit – both on tripod stands, cables, portable and software. All delivered in one package – ready to go (pullout safety barriers not included as standard).

Besides that the full integrated solutions includes either training of personnel or outsourced Safety Guards.

Level Three Integrated Permanent

minimal impact people flow.

When identifying a possible virus carrier the system preferable and ultimately gives a signal to the door shutters, speed gate or similar to the door lock and the possible virus carrier can't enter.

In addition the system gives an alarm (light, sound and/or signal to the remote monitoring room). The possible virus carrier leaves the area or a Safety Officer contacts and isolates the person and either tests additional or asks the person to leave.

Access is continuously active and open for passage.

The technology part of the integrated mobile solutions are the thermal camera and Blackbody calibration unit – both with fixed installation, cables, hardware and software (pullout safety barriers not included as standard). Besides that the full integrated solutions includes either training of personnel or outsourced Safety Guards.

	Level One Handheld	Level Two Integrated Mobile	Level Three Integrated Permanent
Operator	<p>The operator can be employed by the end-user or outsourced to G4S Safety Personnel.</p> <p>The operators are exposed to risk because of the reduced distance to the possible virus carrier.</p>	<p>The operator can be the customer or as an example G4S Safety Personnel.</p> <p>The operator is less exposed to risk because of the longer distance to the possible virus carrier.</p>	<p>The operator can be the customer or as an example G4S Safety Personnel.</p> <p>The operator is even less exposed to danger because of the longer distance to the possible virus carrier and the reduced amount of possible contacts.</p>
Education	<p>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.</p> <p>The Safety Guard needs to have authority when situations exccallates.</p>	<p>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.</p> <p>The Safety Guard needs to have authority when situations exccallates.</p>	<p>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.</p> <p>The Safety Guard needs to have authority when situations exccallates.</p>

	Level One Handheld	Level Two Integrated Mobile	Level Three Integrated Permanent
Positive	<ul style="list-style-type: none"> • Easy to implement. • Mobile and modular. • Know procedure from weapon/metal detection and similar. 	<ul style="list-style-type: none"> • Mobile and modular solution that can be moved to other premises. • Can handle a large number of people and is continuously active. • The solution can be upgraded to level three later. • Easy installation/integration with light, sound and/or signal etc. 	<ul style="list-style-type: none"> • Can handle a large number of people and is continuously active. • The best preventive solutions with the least human interaction and risk.
Negative	<ul style="list-style-type: none"> • Only used with a reduced amount of people. • Battery powered device (4 to 5 hours). • Close contact (small distance) with the possible virus carrier. • In some circumstances less precise when not partnered with Blackbody temperature reference. 		<ul style="list-style-type: none"> • Need often professional installation and integration to existing access solutions. • A permanent solution. • There needs to be a testzone in the entrance that works as a personal sluice.
Pricelevel	Installation: Less than € ???	Installation: Less than € ???	Installation: Less than € ???

The three solutions are illustrated here as drawings of customer installation. All installations are based upon a supermarket entrance but can be scaled to other customer profiles and segments.

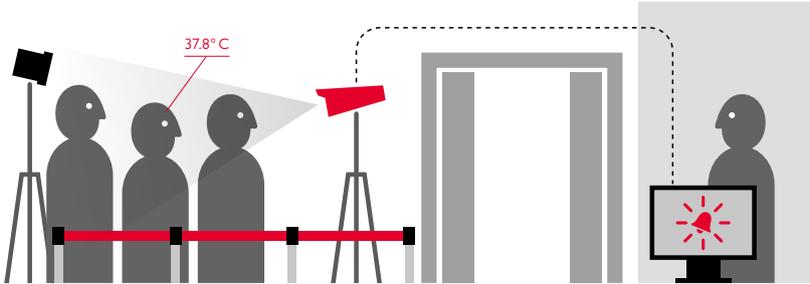
Level One

Handheld
Fever Screening Solutions



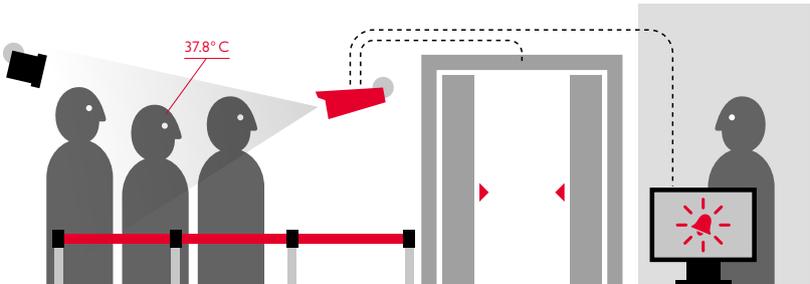
Level Two

Integrated Mobile
Fever Screening Solutions



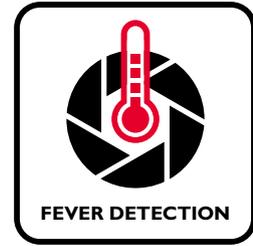
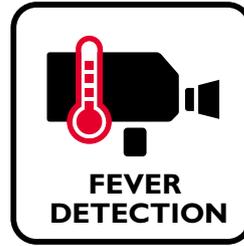
Level Three

Integrated Permanent
Fever Screening Solutions



Pictograms

We have developed two different pictograms illustrating 'Fever Detection' which can be used in connection with the installation of Fever Screening Solutions to inform visitors, travellers, customers etc. that here will be performed a fever screening.



Conclusion

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

There are at least the following concerns that need to be addressed:

1. All solutions demand a partnership with suppliers to ensure a professional experience.
2. All solutions demand clear strategies and procedures.
3. All solutions demand 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 demand an investment in technology and resources.
5. All solutions can be purchased, leased or financed as a complete Integrated Fever Screening Solution.

Our recommendation when risk is significant is Level Two Integrated Mobile Fever Screening Solutions. Level Three in the long term the right solution but Level Two can be upgraded at a later stage.

Level One Handheld Fever Screening Solutions are better than nothing and when used properly with the right education and training it is fine – but the solution is only recommended when there is a limited amount of people who need access. Depending on the risk level the precision of Level One Fever Screening Solutions demands 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 Safety 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. Level Three is most complex but also adds significant value because it can cover larger areas and more people. All solutions demand training and education.

INTEGRATED FEVER SCREENING SOLUTIONS

A combination of security solutions designed to reduce risk, meet compliance and provide added value



As mentioned it is of huge importance to be aware that the best solution is a fully Integrated Fever Screening Solution where the functions of the elements together add more value than the value of each element alone. The Integrated Fever Screening Solution is the sum of experience, people, intelligence, delay and detection.

- Education
- Information
- Special Guard (Safety Personnel)
- Security Operation Center
- Doors, Shutters & Security Glass
- Management System
- Access Control
- Video Monitoring

Notes

Note 1 – Blackbody

Blackbody can be simply understood as a constant temperature reference source (constant temperature can be maintained after power on). When testing human body temperature, blackbody is generally set at 35° C, which is used for temperature correction of thermal imaging acquisition, so as to meet the accuracy requirements of $\pm 0.3^\circ \text{C}$.

Blackbody doesn't need to be connected to the camera, it's separate. After power 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. Therefore, it is required to face the camera and test the frontal temperature uniformly to reduce the impact of temperature difference between different parts.

Note 3 – Installation

Because the outdoor temperature, wind, humidity and other environmental factors have a great impact on the temperature measurement of the thermal imaging surface, it is not recommended to be 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 blackbody and equipment. The temperature measurement value far from the optimal distance will be reduced, and the temperature measurement value close to the optimal distance will be increased. In normal use, there are not many people (width 1.3 to 1.5 meter) at the best distance of temperature measurement. There is no limit to the number of heads in the detection area, but if it is too far or there is overlap it will result in missing or inaccurate temperature measurement.

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

Postscript

This guide Integrated Fever Screening Solutions is written by Steen Bonke Sørensen (steen.sorensen@g4s.com) as primary subject manager with co-creation from 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 Secure Solutions strategy addresses the positive, long-term demand for security services. We do this by designing and delivering industry leading security solutions including:

- Risk consulting
- Premium on-site, mobile and remote security professionals
- Investigations
- Integrated Security Systems – Design, build, operate and maintain
- Monitoring and response security operations
- Data analytics and pre-emptive & predictive security operations

We operate in over 85 countries around the world, providing our customers with unmatched global coverage.

Knowledge Created Together

To execute the strategy, the G4S Academy is introducing four external oriented focus areas:

G4S Academy Specialists Generating Collective Intelligence

The G4S Academy Specialists are the backbone of the knowledge sharing strategy. These are globally aligned and connected resources who are customer orientated, competency mapped, examined and trained.

G4S Academy Repository Knowledge Created Together

The G4S Academy Repository is the content creation and communication platform for seminars, educations, conferences and has a library with guides, cases, tools and newsletters. Sharing of knowledge to create awareness and value.

G4S Academy Network Sharing Knowledge

The G4S Academy Network is a platform for facilitating solution and segment specific networks of customers and other stakeholders with a focus on knowledge sharing, and solution and segment development.

G4S Academy Forum Co-Created Innovations

The G4S Academy Forum is our platform for innovative customers and other stakeholders. It consists of security & safety professionals who's common goal is to make what we do today better and discover new solutions for the future.

The four areas support the G4S Academy mission statement: Working together and using our Global expertise and co-creation approach with our stakeholders, to make all we do today better, and discover new solutions for the future to increase the total value.

Contact

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