SOLUTIONS FOR TEMPERATURE MEASUREMENT, HOW TO MAKE THE RIGHT CHOICE?

The Coronavirus emergency and the new scenarios have created a strong proposal of solutions for remote body temperature detection. We are literally bombarded with offers of various kinds and we are confronted with new solutions and consequently terms: Thermal Camera, Thermographic Camera, Termoscanner. But is the difference clear to you? Let's try to clarify the technical terminology used and consequently on the products available.

With the arrival of **Covid-19,** the needs of public and private institutions, large-scale distribution, public transport, shopping centers, small commercial activities and airports have changed profoundly, as all the different realities each with different modalities must adapt to the **directives issued by the Prime Ministerial Decree,** in terms of safety and containment of the epidemic and in any case implement all the necessary measures to preserve the health of employees, customers or users.

In light of this new collective need, the market has been populated with **new technologies** aimed at satisfying emerging needs. The spread of these technologies was sudden and in some cases a little improvised due to the speed of change and therefore many companies found themselves in great difficulty having to choose the most suitable and most reliable solution for their scenario.

Having clear ideas on the different products on the market is a first step towards choosing the right solution for your case. We try to understand the different specifications of each solution, to make sure that the device we are about to choose has the characteristics that best meet our needs.

What is a thermal imager and what is its function?

The **Thermal Imager** is a camera sensitive to infrared radiation (IR), or electromagnetic radiation. It is also called thermal camera and thermographic camera, but the operating principle is the same.

All objects on our planet have a temperature above absolute zero, therefore they emit thermal energy in the form of electromagnetic waves. **The sensor (or detector) of the Thermal Camera converts these radiation into an electrical impulse, which is subsequently processed to produce a thermal image on a display.**

It is good to point out that all thermal imaging cameras do not emit radiation, but measure infrared radiation with a special sensor that allows us to "see" the temperature and are not dangerous for the staff who use them as well as for controlled persons.

Now that we have clarified what a thermal imaging camera is and how it works, let's deepen the characteristics and differences that affect the performance and application fields of thermal cameras.

Radiometric camera and non-Radiometric camera

The infrared camera was not created as a temperature measuring instrument but as a **radiation converter.** It can be divided into two types:

- **Radiometric** that allows you to measure the absolute temperature value of each point of the image. The electronics of the instrument quickly detects the energy value stored by each single pixel and generates an image, in black and white or in false colors, of the observed object. In practice, the radiometric thermal imaging camera allows you to see a thermal anomaly and to quantify its criticality through the reference temperature.

- **And non-radiometric** which instead allows to detect the thermal energy (in the form of electromagnetic waves) radiated by the objects and then generate a thermal image, which represents the heat distribution of the framed object.

Distinctive features of thermal imaging cameras

Let's now analyze the characteristics that affect the performance of a thermal imaging camera individually:

1. **Sensor Type:** this parameter represents the most important aspect to evaluate, as it directly affects all the characteristics of the thermal imager and also influences the cost of the same. The resolution of a thermal imager equals the amount of pixels and determines the size of the sensor matrix. The larger the matrix, the better the quality of the thermograms. In addition to the quality of the IR image, the resolution also determines the dimensions that can be frozen in a photo (FOV = Filed of View) and the measurement accuracy at a given distance (IFOV = Instantaneos Filed of View). The sensors can be both cooled and uncooled (typically with peltier cells). Cooled sensors are used for research and development applications and have higher thermal sensitivity than uncooled ones.

2. ***Thermal sensitivity (****NETD* *= **noise equivalent temperature difference):*** this is the parameter that indicates the smallest temperature difference that our sensor can discriminate.
3. **Geometric resolution:** influences the quality of the information acquired. The available resolutions are different and the use that must be made of them also depends on them.
4. **Acquisition frequency:** this is a fundamental parameter if you try to measure the temperature of a moving object. In fact, with a sufficient acquisition frequency on the image, the temperature measurement is more accurate.
5. **Temperature measurement:** with thermal imaging cameras it is possible to measure the temperature in every single point of the image but it is necessary to enter the emissivity and ambient (or reflected) parameters in the instrument to detect the correct temperature.

Difference between Thermal Imaging cameras and thermal scanner

To close the circle on the available solutions and the terminology used, let's talk now about the **termoscanner.** Often called by different names such as laser thermometer, remote thermometer or infrared thermometer, it does not differ from the previous ones for the operation but for the results.

The difference between the Thermal Scanner and a Thermal Camera mainly consists of the type of image display on the display and the measurement distance. While the Termoscanner detects a thermal image at a maximum distance of one meter from the subject to be controlled, the Thermal Camera, in addition to being able to perform facial recognition, is able to detect the temperature of the subjects at a greater distance, up to 10 meters.

In addition, some thermal imaging cameras have multi-target functionality and acquisition frequency, to detect the temperature on a large number of people simultaneously and on the move.

Thermal Imaging cameras available on the market and which one to choose

On the market there are different types of thermal imaging cameras and the choice of one rather than another depends on the specific needs and the type of context on which you intend to operate. Therefore in the choice it is important to pay attention to the different characteristics to understand if what we are buying is suitable for our specific case.

Let's see in detail some examples of technologies on the market and their main characteristics.

The MJI390B Bi-Spectrum high precision thermal imaging camera (https://ermes-online.it/en/thermal-imagers/erm-mji390b-en) is a highly sought after product. This technology has a high measurement accuracy. In fact, it has an accuracy of ± 0.3 ° C. Furthermore, with an external blackbody it is possible to reach an accuracy of ± 0.1- 0.2 ° C over a range of 0.5m ~ 10m. It is equipped with a facial recognition system and allows video and thermal image viewing.

The operator in charge of safety can obtain very accurate data from his control post without having to contact the person subject to measurement, with 24-hour monitoring.

This solution is suitable for high traffic environments, as it allows the detection of the temperature on a large number of people on the move.

Another example of a thermal camera is that of the ERM-PJ160B Thermal Camera with integrated blackbody (https://ermes-online.it/en/thermal-imagers/erm-pj160b-en). This technology differs from the previous one in accuracy and distance. In fact, its detection accuracy is ± 0.3 °C at a distance of 0.5-4 m.

Other types of products are thermal imaging cameras with a clearly visible screen (https://ermes-online.it/en/thermal-imagers/erm-df108-en and https://ermes-online.it/en/thermal-imagers/erm-df105-en). The latter allow to detect even if the person wears the mask or not but unlike what happens for a thermal camera, they do not have multi-target functionality. The configuration of these devices is easily done via Ethernet.

Thermal imaging cameras can be connected to an access control system. In fact, the technologies mentioned above have an alarm and access blocking system in case of detection of an anomalous temperature. They can also be connected to a metal detector system, such as those present in airports, for example, or more simply to a turnstile, an opening or an automatic door.

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