

## Inspecting roof mounted solar panels with thermal imaging

*The sales of solar panels are soaring, which helps to reduce CO<sub>2</sub> emissions at electricity plants. Over time solar panels may develop defects which can be easily fixed if detected on time, but can cause a severe drop in energy production and in some cases even start a fire if left unchecked. That is why more and more solar panel installers cooperate with experienced thermographers that offer regular thermal imaging inspections to ensure the safety and effective deployment of solar systems.*

As their temperatures rise solar panels become less efficient, producing less electricity. Some defects can cause them to break down or even produce a reverse current, which might damage the entire solar plant. Thermal imaging cameras can be used to detect hot spots in the panels from a distance, which makes it a lot easier to find defects before they become devastating breakdowns.

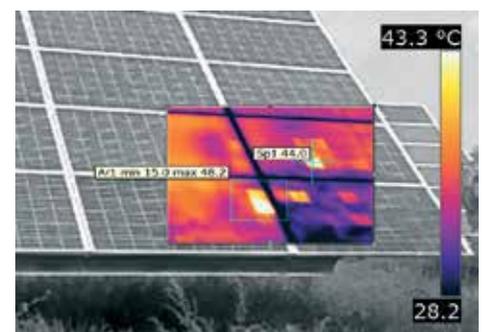
The Italian solar panel installation company ELEM srl is one of the companies that

is working together with Thermographic S.A.S. di Ermoni Alberto e C., an experienced thermographic inspection agency to offer thermal imaging inspections to their clients. This Melzo, Italy, based thermography agency offers thermographers with several decades of experience with thermography. One of these inspectors is Alberto Ermoni, a Level II certified thermographer.

“Thermal imaging cameras from FLIR Systems are the ideal tool for the

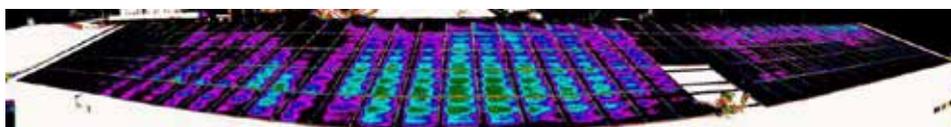


*The FLIR T640bx thermal imaging camera is the perfect tool for solar panel inspections.*



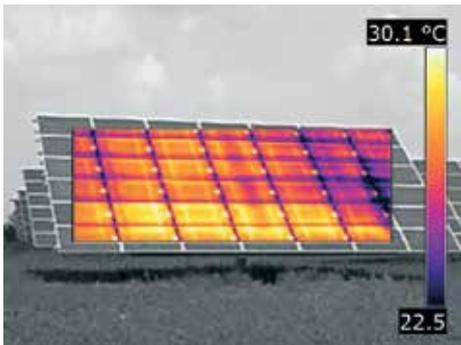
*This thermal image shows some defective cells within a solar panel. Overheating cells impede the performance of the entire photovoltaic system.*

inspection of solar panels”, says Ermoni. “This inspection method is non-destructive and non-invasive. You can use thermal imaging to inspect the solar panels under load, so no shutdown is required. When used properly, thermal imaging cameras will show accurate temperature differences between cells or within a single cell that allow you to identify faults in an early stage.”



*This combination of several thermal images stitched together shows the entire photovoltaic installation.*





These solar modules show no defects, as their temperatures are within the maximum temperature specified by the solar panel producer as normal for operation in sunny conditions.

## Inspect the entire system

These inspections are also not limited to the solar panels alone. "You can use thermal imaging to inspect the entire system, from the solar panels themselves to connections, inverters, fuses and all other electrical components in the system", explains Ermoni. "If any part of the systems starts to wear down or develops a higher resistance for some other reason, the corresponding increase in temperature can be detected very easily with a thermal imaging camera, so you can fix the problem before the system fails."

The thermal imaging camera Ermoni uses for these inspections is the FLIR T640bx. "This camera combines top notch image quality with advanced features like wireless WiFi connectivity with a Tablet PC and a wireless Bluetooth connection to selected Extech test & measurement tools with the MeterLink feature, such as the Extech EX845 clamp meter. These wireless connections really make a huge difference. Another feature that I use often is the Picture-in-Picture feature. This overlay of a thermal image over the visual image allows me to better localize the hot spots."

## Wireless connection with Tablet PC or smartphone

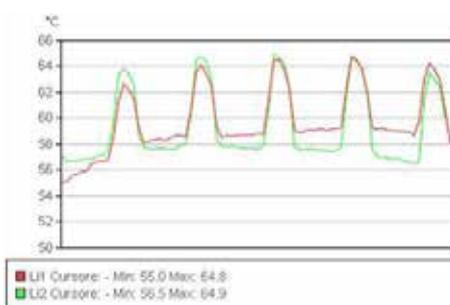
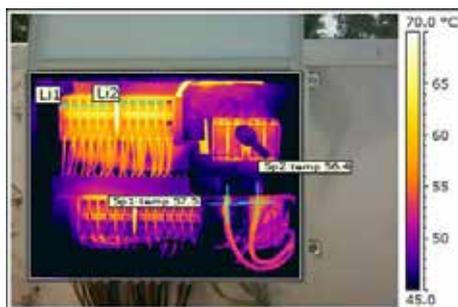
The FLIR T640bx thermal imaging camera contains a microbolometer detector that produces thermal images with a resolution of 640x480 pixels and at a thermal sensitivity of 35 mK (0.035 °C). The ergonomic design allows the thermographer to look at objects from all possible angles. With its bright LCD screen and viewfinder it operates well, even in the sunny conditions that are ideal for solar panel inspections. The wireless WiFi connection between the

FLIR T640bx thermal imaging camera and a Tablet PC or smartphone that is running the FLIR Viewer App makes it easy to show inspection results to clients on site and allows the inspector to produce reports on location, reducing the amount of time spent behind a desk.

The MeterLink connection over Bluetooth allows the FLIR thermal imaging camera to automatically embed measurements from selected Extech measurement devices with the MeterLink feature, making writing down the measurements on a piece of paper redundant. This not only speeds up inspections, it also reduces the risk of human errors.

## Interchangeable lenses

One other very important factor in Ermoni's choice for the FLIR T640bx thermal imaging camera is the fact that it has interchangeable lenses. "In some cases you are standing on a raised platform inspecting solar panels from a distance of 10 meters, but in another situation you might be inspecting the back end of panels from less than one meter distance. In these different situations you need different optics, a telephoto lens for the inspection from a distance and a wide angle lens for the short distance inspections. Many other thermal imaging camera models do not feature this flexibility in optics."



This Picture-in-Picture image and corresponding graph shows two line-analysis strings. The temperature measurements along these lines are similar and remain below the maximum limit. This indicates that these fuses are functioning properly.



Thermal imaging cameras can be used to inspect all components of a photovoltaic installation, including inverters, fuses, cables and connections.

Good solar panel inspections require more than just a good thermal imaging panel alone, however, Ermoni stresses. "Performing solar panel inspections properly can be quite a challenge. When you inspect the front of the panels you need to know how to choose the right vantage point and viewing angle to prevent reflections, , but you also need to know about emissivity and reflected temperature, if you want to get accurate temperature readings".

## ITC certified

For that reason Ermoni has followed several courses at the FLIR Infrared Training Center (ITC). "You really need this type of training to be able to deliver accurate reports", says Ermoni. After becoming a Level II certified thermographer, Ermoni even became ITC instructor himself. "Having seen the importance of proper training in the field I am eager to share the knowledge I have gained with other thermographers."

To Ermoni the choice for a FLIR thermal imaging camera was an obvious one. "FLIR offers the whole package: very high quality cameras with advanced features and excellent image quality, good software, very good after sales service and training courses to match."

For more information about thermal imaging cameras or about this application, please contact:

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