



## Ikaros Solar uses FLIR thermal imaging cameras to monitor installed solar

*More and more solar module professionals are discovering thermal imaging cameras as a solar panel inspection tool. One of the companies that have embraced the use of a thermal imaging camera for this purpose is the Schoten, Belgium, based Ikaros Solar.*

*"Thermal imaging cameras are a great tool to find out whether there is something wrong with a solar panel and to find and identify the problem", explains Danny Kerremans, technology engineer at Ikaros Solar. "We invited several thermal imaging camera suppliers for a comparison and FLIR came out on top."*

Ikaros Solar offers its customers a complete service both in the selection and installation of solar panels as in the maintenance and monitoring afterwards. "Although we also service individuals, we focus mainly on larger, mostly industrial installations", explains Kerremans.

### How does it work?

Solar cells turn sunlight into electricity, but as they do so they also produce heat. Ineffective cells produce much more heat so the ineffective cells clearly show up as a hot spot on a thermal image.

The cause for poor performance in solar panels can be anything from impurities in the semiconductor material due to a construction failure to broken cells, broken

glass, water leakage, broken soldering points, worn down sub strings, defective bypass diodes, delamination of the semi-conductor material or defective connectors, to name just a few of the possible causes.

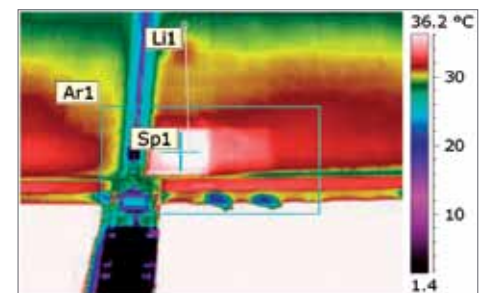
Whatever the cause may be, a thermal imaging camera will help the operator to find out where the cause is located and it will play an important part in finding out what's causing the solar panel failure.

### Comparing suppliers

Using a thermal imaging camera for solar panel inspections is new for Ikaros Solar. "Some time ago I read an article in a magazine about thermal imaging and solar panel inspection was mentioned as one of the possible applications. I did some research



*The ergonomic design and detailed high contrast thermal images make the FLIR T335 the perfect tool for solar panel inspections.*



*Faulty solar cells produce an excess of heat, making them easy to spot with thermal imaging technology.*



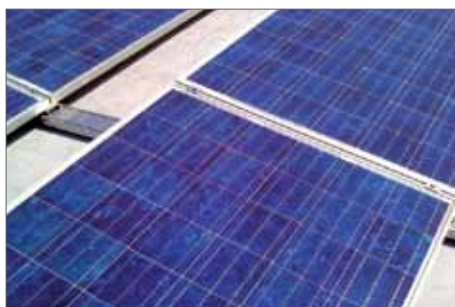
into the subject and invited the five biggest suppliers of thermal imaging cameras for a demonstration. FLIR came out as the winner."

The camera of choice was the FLIR T335 thermal imaging camera. It has an uncooled microbolometer detector that produces crisp thermal images with a resolution of 320 x 240 pixels. It can accurately measure temperatures from -20°C to +650°C with a thermal sensitivity of less than 50 mK. Like all the FLIR T-Series thermal imaging cameras the FLIR T335 is very practical. The FLIR T-Series of portable thermal imaging cameras takes ergonomics, weight and ease-of-use to a new level. Usability is key: the engineers of FLIR Systems have translated user feedback on comfort and clarity into a series of comprehensive and innovative features.

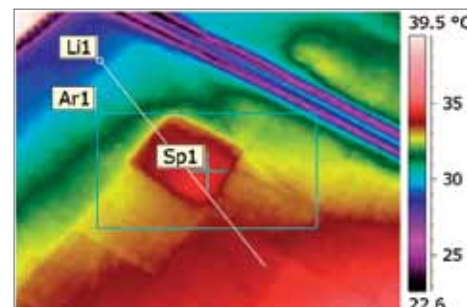
### Advantages of the FLIR T335

"With the FLIR T335 it was much easier to spot small details", explains Kerremans. "And the T335 was also better designed, ergonomically shaped. Especially the tiltable lens unit is a great advantage. It allows you to look at the solar panel from just about every angle possible. That's especially useful if you try to look at a solar panel from the back. With the other cameras you had to lie down to be able to see on the screen what you were pointing the camera at. The FLIR T335 didn't have that problem, can effortlessly see where you are aiming the camera."

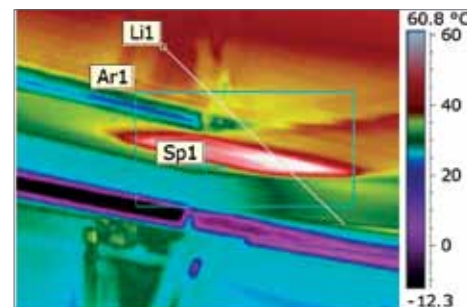
Looking at the back of a solar panel can sometimes be advisable to avoid reflection, Kerremans explains. "The glass on the front reflects thermal radiation, so if you're not careful your own reflection in the glass might show up as a hot spot in the thermal image. This can be avoided by carefully choosing the angle at which you point the camera towards the panel, but if you want to avoid the issue of reflection altogether you can also look at the panel from the other side. Because this side is usually hardly reflective at all you can be quite certain that the temperature measured by the thermal imaging camera is the actual temperature of that part of the panel!"



With a thermal imaging camera you can quickly locate issues such as this damaged cell, so the problem can be solved promptly.



The tiltable lens unit of the FLIR T335 thermal imaging camera allows Kerremans to take thermal images from the back side of the panels, to avoid false 'hot spots' caused by reflection.



### Quick and effective

In the first few months that Kerremans has been using his FLIR T335 it swiftly became an invaluable tool. "It really is a very quick and effective tool. You can walk along an entire row of panels and immediately see whether there's something wrong with one of them. If I see a thermal anomaly then I walk to that location for a closer inspection."

One of the problems Kerremans encounters often is shadowing. "Due to the difference in production between obscured cells and non-obscured cells the entire panel's electricity production will be lowered. This might even cause damage to the panel. But because shadowing causes a rise in temperature in that specific cell, you can very easily spot the location of the problem with a thermal imaging camera."

### More than solar panel inspections alone

But the FLIR T335 can do much more than solar panel inspections alone. "It is also very useful for the maintenance of the rest of the circuit. Just to illustrate: when we had just received the camera I tested it by looking at the electric connectors in one of our solar plants. I immediately spotted

two contacts that were hot and needed to be replaced."

For compiling reports Mr. Kerremans uses FLIR QuickReport. "It's quite simple and very easy to use", explains Kerremans. FLIR QuickReport allows users to organize and analyze the radiometric images from their thermal imaging cameras and present them in a report in just three easy steps.

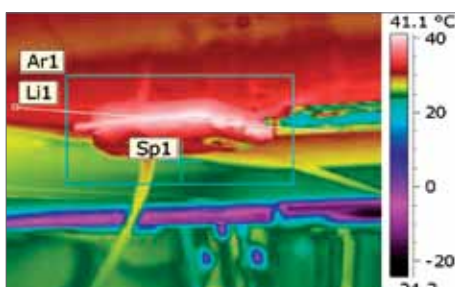
### Picture in Picture

To make those reports easier to read and more compelling, the FLIR T335 thermal imaging camera also contains the exciting Picture in Picture feature. This useful feature allows the user to overlay the thermal image directly over the corresponding visible image taken with the integrated 3.1 megapixel photo camera. "This is going to be very useful, for in large industrial installations it is sometimes hard to keep track of where the problems are located. With the Picture in Picture feature you can locate the problems much easier."

*Some of the defects shown in this article have been simulated.*



The FLIR T335 thermal imaging camera can also be used to scan the other components of the solar installation, such as this faulty connector.



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

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