

Function tests of assembled circuit boards using IR temperature measurement

More and more manufacturer of electronic components and circuit boards turn to the use of non-contact temperature measurement due to the increasing productivity of their components. The thermal behaviour can be captured and optimised through the use of modern infrared measurement devices – without influencing the measuring object.

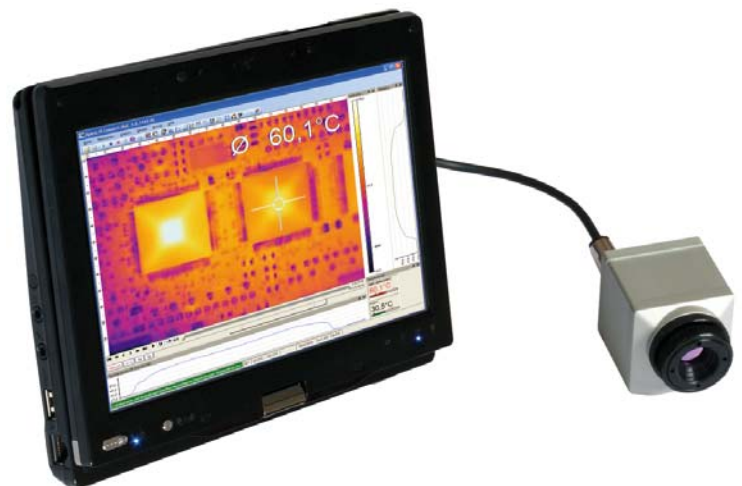
Infrared cameras are used for accurate thermal analysis at electronically components, e.g. in cases where not only one critical component exists or the component can not be clearly defined. Weak points can be localised by the camera through the demonstration of thermal images.

A detailed real time analysis of the thermal behaviour of assembled circuit boards, used in the F&E field or for serial production, can be achieved through the assistance of an infrared thermal imager. The standardized USB2.0 interface allows video recording of 120 Hz. This is extremely advantageous for thermal activities which only emerge on short terms and need to be analyzed in slow motion afterwards. Individual pictures can be taken out of such recordings including all geometric and thermal resolution.

The analysis takes places via efficient software which offers any measure points and user defined rectangles. Alarms can be defined and displayed as well as maximum, minimum and average temperatures. Besides the recording function, the software also offers the possibility to record and storage snapshots. The adaption of the camera software for industrial control is standard.

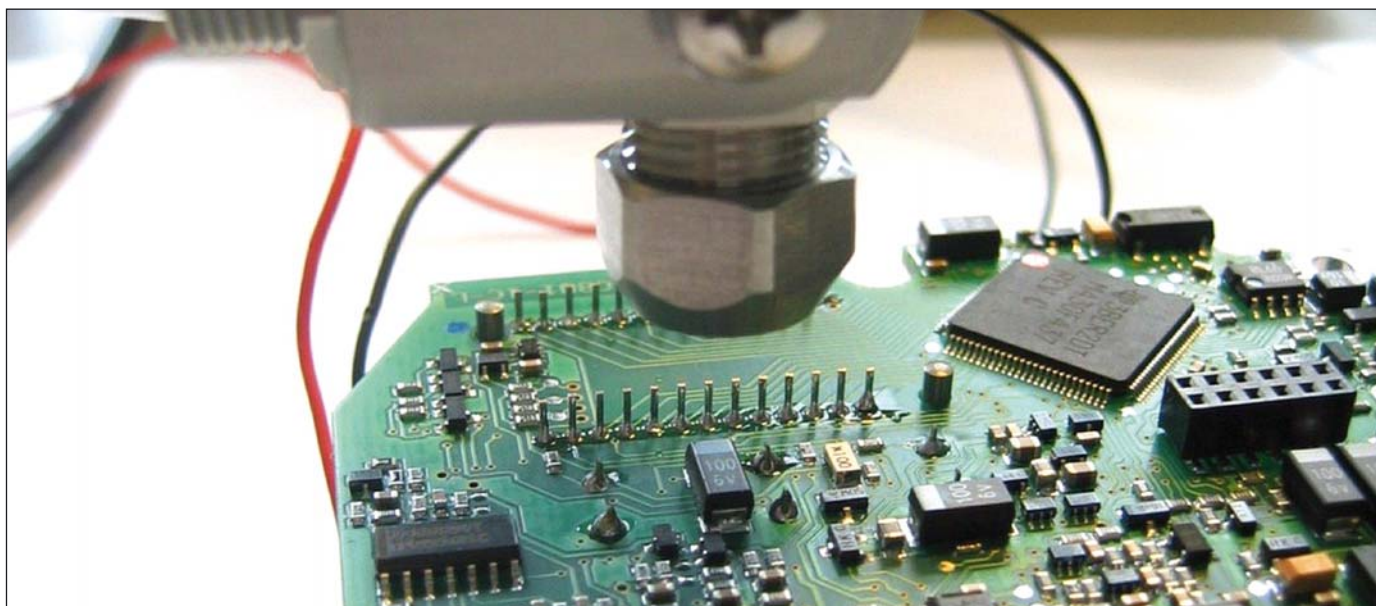
The thermal imager optris PI consists of 160 x 120 or rather 19.200 miniaturized single detectors as a matrix on one chip (Focal Plane Array, FPA). This uncooled microbolometer FPA detector is the image-guided component.

Bolometers are a sub-group of thermal detectors. They stand out through the temperature resistance of their electrical resistor. During the absorption of heat radiation through the sensitive element, the change in resistance calls for a change of the dropping signal voltage via the bolometer resistance. Fast 14 bit A/D converter digitises the increased and serialized video signal. A digital signal processing calculates a temperature for each pixel and generates the familiar false colour image in real time.



Picture 1: Small USB thermal imager for 120 Hz real time analysis of thermal behaviour of assembled circuit boards

An adjustment to different measurement distances and measurement sizes are achieved through the combination of the micro bolometer FPA detector and the high performance optic. Thermal processes of very small objects starting from a size of 50 μm (e.g. smallest SMD components for function tests) are presentable due to small pixel sizes at the detector. Starting from a size of 0.5 mm the temperature of the elements can be measured exactly. The excellent thermal sensitivity of the camera of 0.08 K allows the display of fine temperature details.



Picture 2: Infrared thermometer during temperature measurement of assembled circuit board

It does not always need to be a camera

Due to high production numbers and the large amount of test stations, the use of Infrared cameras can be too expensive. Temperature monitoring with infrared thermometers is a good alternative for series production control of critical components within production facilities.

Critical components which can be repeatedly placed within the series production due to their measuring point (position on the circuit board) will be monitored via the infrared temperature sensor optris CT LT. The temperature measurement result is forwarded to the test station routine for decision making.

Miniaturised IR thermometer for permanent control

Modern production technology not only enabled price reductions within the production process, it also established the multiple uses of infrared thermometers within equipment. The miniaturised infrared thermometers op-



Picture 3: Miniaturised sensor head and electronic box of infrared thermometer optris CT LT

tris CT LT are used for practical applications such as the checking of assembled circuit boards. They are one of the worldwide smallest, measuring infrared temperature sensors with a linear output covering the complete temperature range from -40 to 900 °C.

The small sensor consists of a miniature infrared sensing head (14 mm x 28 mm) and a separate electronic box. The small size of the infrared sensing head allows the implementation in cramped surrounding areas and is therefore particularly suitable for test stations which disclaimed the use of non-contact temperature measurement due to lack of space.

The sensing head comes with a stainless steel housing (IP65) which is robust and intended for the use in surrounding temperatures up to 180°C without additional cooling. An accurate resolutory optic with a distance-to-measurement-point-proportion of 22:1 allows a flexible choice regarding the installation point within the test station. An additional innovation is the possibility to measure smallest spot size up to 0.6 mm due to a small ancillary lens.

The evaluation electronic (IP65) offers multiple signal processing methods. The measured temperature signal of the circuit board is made available to the operator via linear 0-20 mA, 4-20 mA, 0-10 V or thermocouple-output. An included control panel with LCD display allows the choice of the signal processing method as well as the parameter adjustment at the assembly area. The programming can take place through an included USB or RS232 interface, supported by a PC or Laptop-PC. For the implementation of existing datas, different addressable interfaces are available, such as a RS485 interface or CAN-Bus, Profibus DP, Ethernet and alarm relays.