

Highly informative results with 3D AOI

Quality from all perspectives

In contemporary electronics manufacturing, automatic optical inspection (3D AOI) is an established component of quality control. From image quality and analysis of results to the networking of inspection data in order to optimize production processes, the technologies used continue their relentless development.

A company purchasing a 3D AOI system wants to ensure that it is manufacturing its electronic products in the very best quality and it wants to guarantee they will have a long service life. The machine should offer superlative 3D and software features, excellent measurement accuracy and exceptional image quality as well as a robust construction. An EMS (electronic manufacturing services) provider who is manufacturing for a range of customers and markets is going to be interested in easy programming and the highest level of adaptability. He wants to be able to cope with different products in large or small quantities and yet always be in a position to identify any manufacturing defects rapidly and without fail. When dealing with high volume, throughput is of prime importance. And if the electronic product is to be used, for instance, as a distance warning system, lane departure alert or a parking assistant in a motor vehicle, safety becomes a very important quality factor.

One reason why the image quality of a 3D AOI system is an important item in

the priority list is that the components on the circuit board are continually becoming smaller. If you take the size 03015, for instance, the component is only 0.3 mm long and has a microscopic width of 0.15 mm. Moreover, packing density on the circuit board is increasing all the time, where the smallest hairline bridge between the solder joints can cause a short circuit. The resolution of the inspection system must therefore lie in the range of a very few micrometers, and the image processing must also be consistently reliable at very high production speeds. In Viscom's S3088 ultra gold 3D AOI system, for example, the XMplus sensor module, a very powerful frame grabber and intelligent control software ensure optimal results and inspection speeds. The image field size is 50 mm x 50 mm and the image data rate goes as high as 3.6 gigapixels per second. This is how inspection speeds of up to 65 cm² per second are achieved.

Very precise height values

Inspection in 3D is being increasingly used in practical applications and has proved its worth against the background

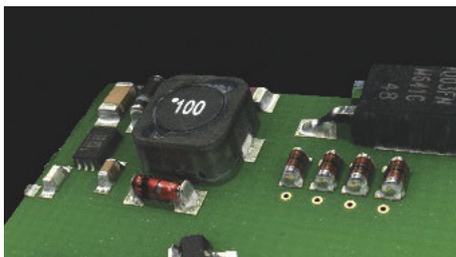
of miniaturization, for instance in presence checks. Different colors of the various components and circuit boards are irrelevant in this examination step and there is no longer any need to adjust the lighting at any stage. The component is positively identified with the aid of a 3D grid. As for misalignment and coplanarity, there are, for instance, very strict limits with regard to LEDs, particularly if they are used in the automotive sector. The diodes must be precisely positioned and they must lie exactly flat on the circuit board within a very few micrometers. Staying with the example of the S3088 ultra gold, very precise height calculation is possible thanks to a z resolution of 0.5 µm. This can be used with component heights of up to 30 mm.

The best image information all round

If there are any abnormalities which are not clearly identifiable during automatic defect detection, the verification station keeps the findings accessible for a final decision. A team member classifies these results and Viscom provides particularly intuitive aids to help. It is no longer neces-



Rapid access to different views in Viscom's vVision operating software



3D view of a circuit board section with soldered components



Tombstone effect with 01005 capacitors



Viscom's 3D AOI system S3088 ultra gold features an impressive sensor system for maximum throughput

sary for dodgy circuit boards to be removed from the line and assessed manually. Instead, informative color images of critical parts viewed from different angles are available on the screen. Edge enhancement, zoom and gamma correction make the inspection easier. The microscope is practically superfluous.

The ability to examine relevant areas in 3D from freely selectable viewing angles has also been developed with the verification station in mind. The texture in the 3D images exhibits no lateral inaccuracies. The angular cameras used by Viscom as standard are particularly useful for this purpose.

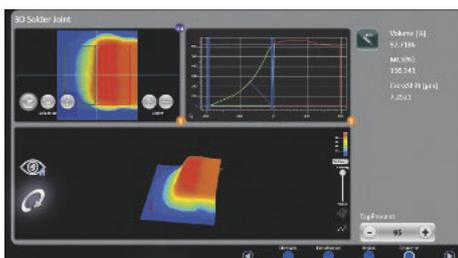
Classification supported by AI

A further major advantage is that today the verification data of several lines or several inspection gates can be consolidated at a single workstation. Manufacturing and classification can therefore be spatially completely separate from each other. State-of-the-art verification aided by artificial intelligence (AI) is also gaining ground. The objective of this novel solu-

tion for electronics manufacturing is to provide machine operators with intelligent assistance during classification. The idea is that the operator on the production line and a Viscom software solution based on artificial neural networks should combine forces to arrive at a completely safe and reliable decision. The artificial intelligence system learns, gains experience, and can increasingly be given more responsibility.

Networking and traceability

Inspection systems also provide important information to inline monitoring systems and the manufacturing execution system; they also communicate with other machines in the production line. If, for example, a potential defect is detected during the solder paste inspection (3D-SPI), the 3D AOI system S3088 ultra gold can be automatically instructed from there to take high-resolution color images with its cameras from all nine angles. Viscom's own proven software solutions such as Quality Uplink are supplemented by interfaces that are realized together with cooperation partners, for example Fuji Smart Factory with Nexim, the Panasonic iLNB solution or OIC and PULSE provided by ASYS. The IPC Hermes Standard is making headway in machine-to-machine communication as a modern alternative to the SMEMA protocol. This relatively new and open protocol based on TCP/IP and XML is independent of any manufacturer and Viscom is progressively integrating it into its systems. In the field of the Industrial Internet of Things (IIoT) Viscom has partnered with the IPC CFX (Connected Factory Exchange) initiative.



Height profile with color coding of a solder joint and volume assessment



CONTACT:

Florian Martin is head of product development at Viscom AG, where he is responsible for the success of the optical inspection systems now used around the globe for reliable defect detection in the production of electronic assemblies. Using his experience, he works with external partners on various future-oriented issues, particularly in the field of digitalization.



COMPANY PROFILE:

Viscom AG is one of the world's leading providers of automatic inspection systems for electronic assemblies. The model range extends from high-performance 3D AOI systems for inspecting solder paste, placement and solder joints, to inspection systems for MID, wire bond and conformal coating inspections. The X-ray inspection area covers the complete bandwidth from microfocus X-ray tubes through offline inspection islands with μ CT functionality, up to fully automated 3D in-line X-ray inspection. Viscom systems are leading-edge technological products used successfully around the globe by renowned companies in varied industries, including the automotive, electronics and semiconductor industries, aerospace technology and medical technology. With branch offices in Europe, Asia and the USA, as well as a tight network of representatives, Viscom is present around the globe.



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