

Complex circuitry
for telematics:
Fast and reliable inspection
with combined AOI/AXI



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The Kapsch Group is one of the foremost companies in European traffic and communications industry. Public recognition of the Group associates them primarily with the major toll projects they have developed and realized in Austria, and then in other countries. The end customers expect that these complex solutions will function flawlessly. Kapsch is well aware that the quality of their electronics is essential; therefore they invest in inspection solutions that guarantee not only quality, but also flexibility and cost-efficiency in SMT production.

The company checked their offline solutions, which proved to be too slow and time-consuming, and explored optimization possibilities. In this process, Viscom systems were benchmarked against other inspection systems; thus, the ultimate decision for Viscom was very well-grounded.

The Kapsch Group: from telephone manufacturer to system provider for innovative traffic telematics and telecommunications

The Kapsch history stretches back to the year 1892. At that time, a staff of 18 manufactured signal transmission equipment, telegraph stations and Morse apparatuses. From development of the first telephone apparatuses, TV equipment and telegraph cabinets to the later realization of entire communications and infrastructure solutions for road and rail; today, the company has attained a significant technological lead.

Currently Kapsch, with subsidiaries, representatives and holdings around the world, is supported by over 2,600 employees. Since 2001, the Group has been structured in three business divisions. Kapsch Business Com AG is the partner for realization of communication solutions tailored to small and medium-sized companies, as well as major enterprises. Kapsch CarrierCom AG is concerned with new solutions in communications technology for operators of fixed, mobile and data networks. Kapsch TrafficCom AG is service provider of systems and components for road and rail traffic telematics.

One major focus at this company is the development, operation and management of toll, access and security systems. A very important milestone in this regard was the 2003 realization of the largest toll system in the world in terms of surface covered, in Austria.

Innovative, high value electronics – from toll systems to e-card readers

Kapsch Components KG is responsible for development and manufacture of their own electronic components. Yet even for orders from external customers, the company is a reliable, competent partner, which already guarantees its longstanding experience in production of high quality electronic products.

With over 170 employees, their service offerings range from complete solutions including engineering to accepting individual commissions. While small and medium production lots can be flexibly implemented, the concentration here is on series production. Stefan Punkenhofer, responsible for inspection plan creation and supervision of the Viscom inspections, summarizes the strengths of Kapsch Components as follows: „We deliver peak quality at a reasonable price, very high flexibility in production and short reaction times.“

„Our current high runner,“ states Punkenhofer, „is the onboard unit for a toll system. This is where we now have the greatest piece counts. We also produce the required camera module in-house. This is on the order of 1000 cameras. This product alone carries six highly complex circuit boards.“

One other product demanding the utmost quality is the e-card reading device manufactured by Kapsch Com-



The inspection system X7056 in the production area
L-r: Stefan Kessler, Viscom representative to Austria (Stepan Gesellschaft m.b.H.), Stefan Punkenhofer, Stefan Denk (Kapsch Components KG)

ponents KG to process Austria's electronic health insurance vouchers, including connection to the network.

A first class inspection solution is required for this and many other products. „Today, high quality is more important than ever. Ensuring this requires a reliable inspection of all products, to maintain our customer's standards as well as our own," as Stefan Punkenhofer describes the quality demands within the company.

Selection of the suitable inspection equipment – securing quality economically

As Kapsch embarked on its search for a suitable inspection solution, the points flexibility, speed, precision and high resolution stood at the very top of their wish list. And, an X-ray inline solution was their absolute prerequisite.



SMT production with AOI/AXI

Stefan Punkenhofer describes the situation: „Cycle time was a most essential criterion for this system. For one order at that time, we had to deliver a specified number of products. This meant a cycle time of about 6 seconds per piece, or about 30 seconds per panel. That was the internal requirement.“

In sum, three aspects were especially important. First: high inspection speed which supported production economics and did not hinder throughput. Two: high precision, meaning extensive inspection depth which could also reliably inspect even the smallest components to meet future demands the assembly would be subject to. And third: the new inspection system should cover the wide range of orders processed at the company with complete flexibility.

The printed circuit board dimensions processed at Kapsch are a maximum 360 mm x 460 mm, assembled with components down to C0201, QFPs to 0.15 mm and BGAs to 0.15 mm.

After extensive testing, all decision makers at Kapsch Components decided on the X7056 from Viscom. The



Toll system onboard unit

combined inspection, incorporating both optical and X-ray inspections into a single system, was most convincing. The AOI can perform both orthogonal and angular inspections and flexibly adapt the resolution to the assembly on the printed circuit board. This supported the high throughput which was a prerequisite. Yet another plus point, as stated by Kapsch, was the uniform user interface in both AOI and X-ray operation.

Defect detection during AOI and X-ray inspection

The optical inspection was deployed to inspect printed circuit boards for such defects as open solder joints, component polarity, faulty positioning, missing components, short circuits and defective markings (laser inscriptions for inline DMX).

The X-ray inspection came into play to seek out solder defects on the BGAs, QFNs and FlipChips and the ground planes (e.g. on TO220 and also QFN components) – in other words, all solder defects which could not be detected with the AOI.

With the X7056, several tasks could be resolved with one system: the difficult inspection beneath shielding panels, a positive inspection for hidden effects and last but hardly least, inspection for visible defects. In this context, the fast cycle time of the combined inline solution proved itself an especially great advantage.

„This combination permits a very high PCB throughput at optimal inspection depth to be attained, even when the circuits are extremely complex," says Stefan Punkenhofer. He continues: „The advantage with this inline solution is that circuit boards we used to inspect on an AOI and then had to transfer to X-ray for additional inspection are now inspected in just one step; the significant advantages here are obvious.“

Are you interested in more details on this application or do you have any question regarding combined inspection?The Viscom SP Division will be glad to help you.

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