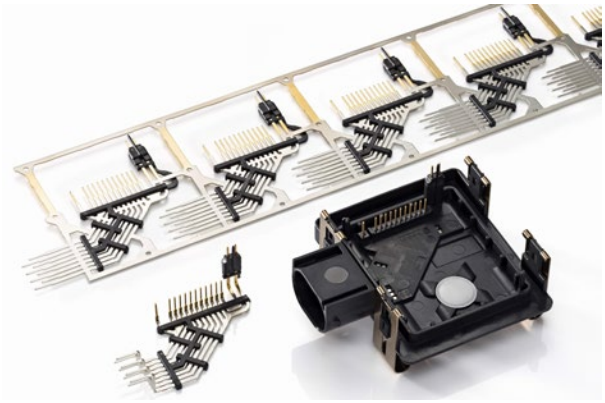
Application Note

KRAMSKI: Accelerated Try-Out Process with ATOS Capsule

Site / Country: Pforzheim, Germany
GOM System: ATOS Capsule
Company's field of work: Stamping and injection molding technology

Being part of the KRAMSKI Group, the stamping and injection molding company uses optical measuring systems to inspect initial samples of demanding hybrid components. In doing so, iteration loops during tool try-out can be shortened significantly.

Only a few years ago, driverless cars were no more than an unrealistic utopia. Yet nowadays, automotive companies and businesses in the high-tech sector are working towards series production of such autonomous vehicles. Being an optional extra in every new car, today, driver assistance systems give us a taste of what the future of driving has to offer. They make driving safer, while increasing comfort at the same time. KRAMSKI produces an important component for one such assistance system: the housing of the mid-range radar sensor (MRR), which is used for various driver assistance functionalities, such as to adaptively regulate speed and distance, or to make emergency stops.



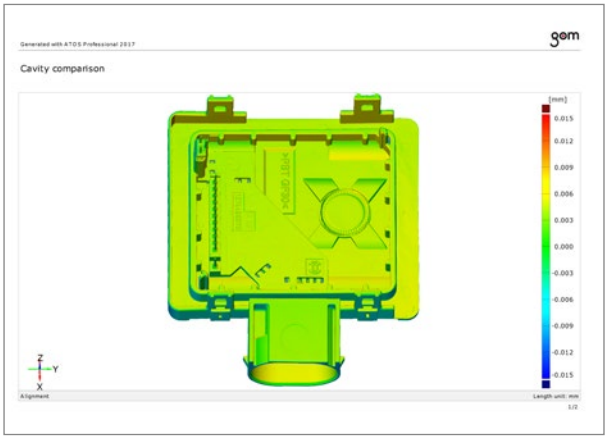
From pre-overmolded stamped parts to the housing of a mid-range radar sensor

The KRAMSKI MRR housing belongs to a range of hybrid parts – assemblies made from metal and plastics. The component is made up of a delicately curved stamping part that has been overmolded with plastic. There are several production lines involved in the process: The initial stage involves metal grids being stamped in a progressive die and then electroplated. The stamped strip is subsequently subject to a pre-overmolding process. The contact pins are bent and completely overmolded in an injection mold with several cavities. In further fully-automated steps, a membrane and several springs are fitted. During installation, all joints must be sealed and even the smallest contact plugs must be positioned optimally.

Optical precision measuring machine supplements tactile coordinate measuring technology

KRAMSKI employs various measuring systems in order to assure quality during production. Stamping parts are initially measured by 2D cameras as continuous stripes on the production line so images can be analyzed. Conventional coordinate measuring machines are used to perform inspections during series production, recording defined features and delivering figure-based measuring reports. In a similar way, 3D coordinate measuring machines are used in tool and mold making. Conventional measuring technology is not always sufficient for tool recursions as components are constantly becoming more complex and measuring point information density is limited. As such, KRAMSKI has recently started using an optical 3D measuring system from GOM. "We were looking for an imaging technique that can provide us with more than just punctual 3D data," explains Mathias Schlegel, head of measurement technology at KRAMSKI in Pforzheim.

Optical measuring systems enable full-field measurements and provide a complete overview of the part. The measuring results are visualized and easy to understand. "It is very work-intensive to compare measuring results using figures, especially when there are multiple cavities. As such, the color representation of the deviations is a great help." By implementing optical metrology, KRAMSKI aims to significantly accelerate the time between the try-out process and the final start of production. Faster results save a lot of time in individual recursion loops and, ideally, reduce the number of loops required in the medium to long term.

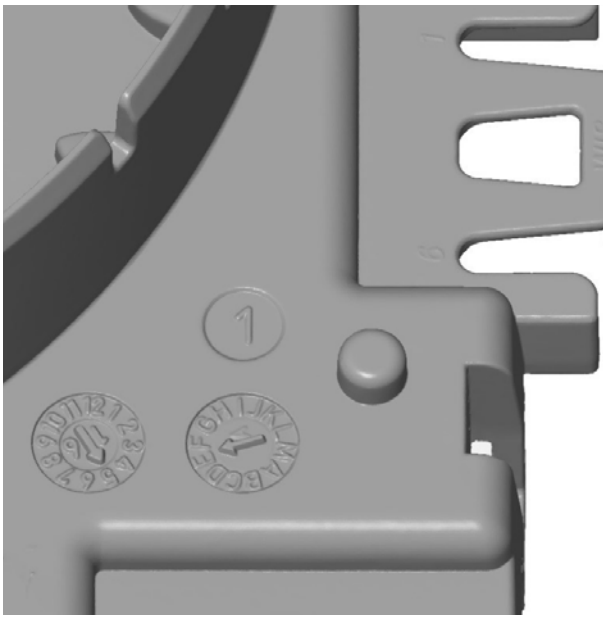


Reporting in GOM Inspect Professional software: comparing cavities using a color plot

"Compared to the coordinate measuring machines used to date, we can now save considerable amounts of time. Particularly when measuring recursions, we get results very quickly, which can be used to evaluate whether the optimization was successful. Furthermore, generating a measuring report has become very fast and easy," explains Mathias Schlegel.

ATOS Capsule impresses in benchmarking

KRAMSKI opted for the ATOS Capsule optical precision measuring machine after undertaking a comprehensive selection process based on defined goals and requirements. Aspects such as time-saving during the measuring procedure itself, as well as system user-friendliness, were included in the selection criteria. They initially opted against a CT measuring device in favor of a fringe projection system. "Our requirements mainly entail external geometries. Insights into the part interior are hardly ever needed – considering the high costs for acquisition and maintenance, a CT system is not reasonable at the moment."



Detail sharpness of the ATOS Capsule data as a selection criteria for an optical 3D measuring system

Mathias Schlegel, head of measurement technology at KRAMSKI in Pforzheim

This was followed by a benchmarking comparison of non-contact 3D measuring systems from six different providers. KRAMSKI eventually chose the ATOS Capsule from GOM. Aside from the impressive detail sharpness, GOM's measuring system also provides a complete solution: Sensor, software, rotation table and lift module are all produced on the same site and are perfectly matched. This means incorporating and operating the system is much easier.

"We looked at the components' STL meshes and with the GOM system, they were simply clearer than with other manufacturers. It was possible to see a lot more details, such as the tiny numbers on the date stamp. The ATOS Capsule also provides an extremely satisfying result when measuring the surface of the plug box located deep in the MRR housing. Furthermore, GOM offers one of the few optical systems with an additional touch probe for areas which are difficult to see."

Comparing cavities for tool optimization

In KRAMSKI's measuring lab, initial samples from the multiple cavities of the try-out tool are measured one after the other. The ATOS Capsule is operated on a semi-automated motorization kit consisting of a Tilt and Swivel Unit and a lift module. As such, part and sensor can be ideally positioned for measuring.

When all initial sample parts have been measured, evaluating and comparing cavities can be done immediately within the supplied GOM Inspect Professional software. By comparing the nominal data from the CAD with the actual data measured, GD&T of individual features and radii, as well as pin positions in the connector area can be inspected. "We can gain an excellent overview of surfaces and any irregularities with the full-field color image that is produced. As such, we are able to quickly point out problem areas to staff working in toolmaking or construction. These areas can be detected and made transparent without figures," explains a KRAMSKI measurement technician.

In addition to comparing cavities for tool optimization, follow-up tools and replacement tools are also evaluated using the GOM optical measuring system. KRAMSKI also uses the ATOS Capsule to inspect embossed stamps on tiny stamped parts and to measure delicate parts, such as cartridge housing for blood sugar measuring devices.

The use of the new measuring system at KRAMSKI is continuing to grow: "Among others, we are using plastics reinforced with glass fiber, which have abrasive effects, meaning that it is very relevant for us to measure the extent of wear and tear that the molds have been subject to by way of a part trend analysis. Firstly, we would like to avoid recursions, measure wear and tear and increase the speed at which follow-up tools are re-qualified. We are also focusing on comparing parts used in multi-cavity tools. In doing so, it is also possible to determine whether, by optimizing a few elements which make up the tool cover, dimensions can be adjusted to fit into the tolerances. This means that ATOS Professional software can be used to minimize outlay."

Initial sample parts for comparing cavities

Manufacture of cartridge housings for blood sugar measuring devices

Reel-to-reel mounting on a hybrid production line

KRAMSKI GmbH

The KRAMSKI Group develops and produces technical highly-sophisticated stamped and injection-molded parts, as well as assemblies and tools for innovative mass-produced products which are put to use in the automotive industry, medical technology, the electronics sector, as well as other fields of application. The corporate group has around 900 employees across the globe with sites in Germany, USA, Sri Lanka and India.

GOM GmbH

GOM develops, produces and distributes software, machines and systems for 3D coordinate measuring technology and 3D testing based on latest research results and innovative technologies. With more than 60 sites and more than 1,000 metrology specialists, GOM guarantees professional advice, as well as support and service across the globe. More than 14,000 system installations improve the product quality and manufacturing processes in the automotive, aerospace and consumer goods industries.