

## New electronic bore gauge automates bore data acquisition on the shop floor for aerospace components manufacturer

Aerospace pioneer Kamatics Corporation has engineered solutions for aerospace applications since 1966. Today, the company continues innovating with a new digital bore gauge developed in collaboration with Sunnen. The new portable gauge provides precision measurement and verification of custom parts with integrated data collection.

In the early 1960's, rotor flap bearings were failing at an alarming rate on SH-2 Seasprite helicopters deployed on frigates at sea, so the United States Navy needed a bearing liner that could stand up to the harsh conditions of maritime missions. As a result, engineers at Kaman Aircraft Corporation, designers of the Seasprite, developed KAcarb®, a material that worked so well a new company was built around its continued development and manufacture. The company, KAcarb® Products, soon became Kamatics Corporation and today develops custom bearing solutions, engineered products, flexible drive systems and other precision parts for the most demanding aerospace, defence, marine, and industrial applications around the globe.

"We say Kamatics was created by a spirit of invention and innovation and, more than 50 years later, that's still our primary drive," says Chris Sopolak, senior team leader of Components Manufacturing for Kamatics' Spherical Value Stream. "While we continue to produce catalogue products, our value to our customers is in our problem solving and new product development is at an all-time high. We have a high-mix, low-volume operation and we always look for ways to increase productivity, and profitability. With thousands of part numbers, multiple materials and tight-tolerance precision parts, it can be challenging."

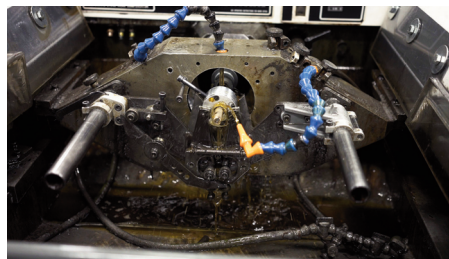
Kamatics uses lean manufacturing to limit the number of setups and single-minute exchange of die (SMED), a system that dramatically reduces the time it takes for equipment changeovers, to make custom bearing assemblies as efficiently as possible. Components are machined from bar stock and finished by honing, prior to assembly



Sunnen's new PGE-6000 digital bore gauge incorporates a touch screen display, allowing quick and easy adjustments to the gauge settings



Using the new PGE-6000 digital gage, operator checks the bore diameter on the honed workpiece to be certain it is within tolerance



Kamatics hones parts on a Sunnen ML-3500 horizontal honing machine



Kamatics places the Sunnen bore gauges on the shop floor next to honing stations for in-process measurement, as well as final inspection. Operators cite the portability, large range, high repeatability, and high accuracy as advantages of the PGE gauges

and final verification. "We have too many part numbers to make air gaging sustainable, so we had been using Sunnen's analog PG Bore gauges," explains Chris Sopolak. "We use four Sunnen ML-3500 hones to final finish all our machined metal bores to tolerances between three-tenths and five-tenths. We put the bore gauges on the shop floor right next to our honing stations for in-process measurement, as well as final inspection. Our operators like the portability and they have a large range, high repeatability, and high accuracy."

One bottleneck in production was the requirement of writing down all bore gage measurements and then inputting them into a Statistical Process Control (SPC) system for analysis and serialisation. In addition to being slow, this manual process allowed the possibility of transcription errors. As Kamatics' production of custom parts continued to increase, it wanted a way to easily capture and use available data to further refine operations.

"We started discussing the possibility of a digital gauge with Sunnen, and, using the analog PG-800 gauge as a starting point,

the joint development teams were designing the new digital gauge very quickly. We had a very aggressive feedback cycle, 24-hour software updates in some cases, and the two teams worked well together."

The result of the collaboration, the Sunnen PGE-6000 electronic bore gauge, was beta tested on the Kamatics shop floor about a year later. The company now uses the digital gauge to eliminate guesswork and unnecessary gauging and precisely control final bore size. "The electronic bore gauge removes the complexity from the measurement process," says Chris Sopolak. "Setup is easily accomplished with Sunnen's existing PG-400/500 setting fixtures, and the setup menu holds all of the information required for part inspection. However, the key is the internal data storage for use in our SPC analysis and lean manufacturing operations."

Phil Hanna, product manager Sunnen

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Products Company, adds: "As Kamatics has seen, the PGE-6000 electronic bore gauge is a viable alternative to air gauging in many instances. It brings reliable, flexible ID gaging to the manufacturing floor with no need for probes or master rings. It handles an excellent range of bore diameters and types of materials, so a single gauge can measure the thousands of different parts produced at Kamatics. Serialised part measurements are stored in the gauge and then easily transferred to the SPC system for analysis via a direct cable connection to a PC or via a USB drive."



Kamatics uses the PGE 6000 digital gauge to eliminate guesswork and unnecessary gauging, and to precisely control final bore size. According to Kamatics, the electronic bore gauge removes the complexity from the measurement process and enables internal data storage for use in SPC analysis and lean manufacturing operations



Kamatics Corporation develops custom bearing solutions, engineered products, flexible drive systems and other precision parts for the most demanding aerospace, defence, marine, and industrial applications around the globe

The new electronic gauge was recently introduced industry-wide and fills a void that has long existed between manual bore gauges and air gauging systems that lack flexibility and are much higher in cost.

Sunnen views collaborations as a vital component to extending and refining its product line. "The joint development project with Kamatics is an example of the forward thinking and advanced research that help make Sunnen a bore finishing

technology leader," says Phil Hanna. "These collaborations allow us to quickly bring new field-proven technologies to the market and support the evolving demands of our customers."

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