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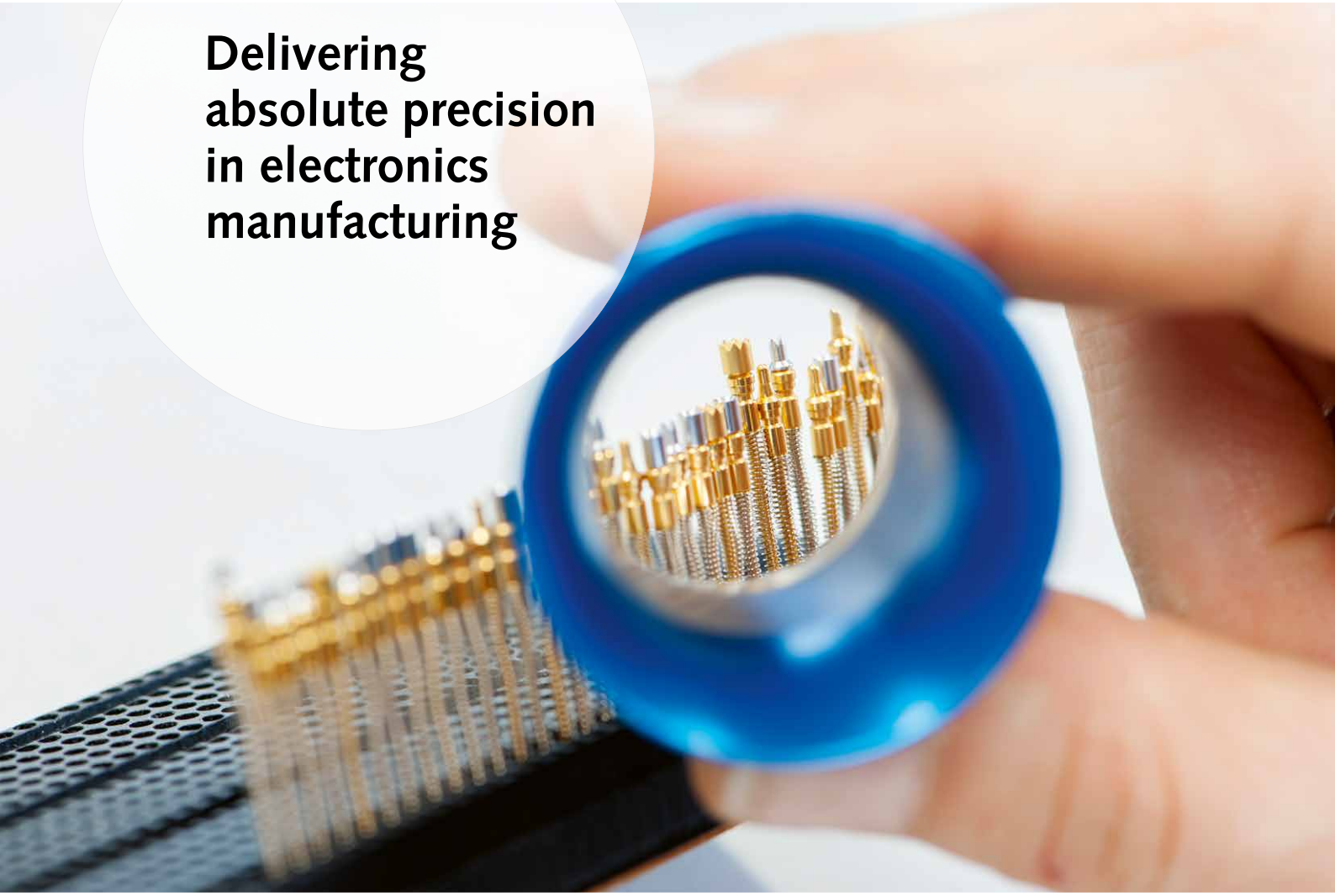

In-process quality control as a key to success

Inline process monitoring for spring-loaded test probes with Kistler sensors

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Within the test equipment sector, INGUN is an iconic manufacturer of test probes and systems that deliver absolute precision. These products have to meet the highest quality requirements – and that's why Kistler's high-precision sensors also monitor all INGUN's quality-relevant production processes.

With a workforce numbering 320 spread across the globe, INGUN produces test probes as well as both customized and non-customized test fixtures for use in testing equipment in the electronics industry, where they are needed to test the various functions of electronic printed circuit boards. The core elements of the products developed by INGUN are spring-loaded test probes which con-tact the PCB and receive information via electrical pulses. At its base in Konstanz, Germany, the company manufactures test fixtures for all commonly used testing systems – ranging from manual, pneumatic and vacuum-operated test fixtures to special adaptations.

The electronics industry: responding to a fast-moving market environment

Most of INGUN's customers originate from the electronics industry, which has to keep pace with the needs of a market that is moving at breathtaking speed. As the industry that is spearheading the digitization of industrial production, the electronics sector has to drive innovations ahead quickly and consistently. In sectors such as automobile production or communications technology, customers' testing requirements are becoming more demanding as time goes on. The Konstanz-based test equipment manufacturer has to respond to this challenge in two ways: by continuing to develop its test systems, and by introducing new, innovative products on a rolling basis. Thomas Schrodi, Head of Automation and Product Development at INGUN, explains: "The electronics industry is highly dynamic – products change at extremely high frequency and for us, that means a continuous increase in the variety of test probes. Just a few years back, the phase from approval of drawings to delivery of finished products took about three months. But nowadays, that time has been slashed to around six weeks. To continue accommodating our customers' needs, we have to be flexible and fast, and we must ensure utmost quality and precision in our production." Product life cycles are becoming ever shorter – and to add to the challenges, the trend towards miniaturization is becoming more marked. As electronic equipment becomes smaller, the requirements for precise measurements are increasing.

Quality is monitored directly during the joining process in the manual manufacturing operation for special small-series items.

Kistler force sensors and monitoring systems for absolute precision

Quality is also the focus of attention for Klaus König, who has worked on developing equipment and automated plant at INGUN for the last eight years. He points out that Kistler's sensors and systems play a key part in ensuring precise and reproducible testing of electronic components: "For the last 20 years, our company has put its trust in innovative measurement technology from Kistler to measure spring force in our probes with maximum accuracy. And the results have been successful. We can only guarantee the quality of our high-precision testing systems if the test probes function perfectly."

With product life cycles becoming shorter all the time, production time frames have become much tighter. Thomas Schrodi comments: "Customers demand far shorter times-to-market nowadays. So it's no longer possible to wait up to nine months for a new production

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Thomas Schrodi, Head of Automation and Product Development at INGUN
INGUN Prüfmittelbau GmbH, Max-Stromeyer-Straße 162, Konstanz, Germany, www.ingun.com

plant. This is why, four years ago, we began manufacturing the plant we need to produce the test probes here in-house." By taking this step, INGUN has gained enormous flexibility: now that mechanical engineering has been integrated into the company as a core competence – which also means that production know-how is located in-house – new production plants can be set up far more quickly, and with greater attention to individual details. Given the vast range of diverse products that INGUN offers its customers, this new-won flexibility in the production process is an exceptionally important asset for the firm.

INGUN currently has 14 automated plants that produce its test probes. A new plant is added every year: "The growth of our plant inventory shows that market demand for our products is constantly on the increase." Production on these plants takes place in multiple stages and, in the last step of each process, the test probe itself is tested with Kistler sensors. The plants are equipped with type 9217A or 9340A1 force sensors and each of them is fitted with a Kistler maXYmos monitoring system. Thanks to force-displacement monitoring, the functionality of each and every test probe is verified at the end of production. By integrating quality control into the automated manufacturing process, INGUN ensures that bad parts are directly excluded from production.

The last step in automated production is to verify the spring force of the probes.

Likewise, maXYmos BL and the type 9340A1 sensor are deployed in the manual production process for small series assembly. This ensures that 100% quality can also be guaranteed in the firm's manual production. "That gives us the advantage of implementing one and the same quality testing process in our manual and automated production operations. With maXYmos BL, we've found a system that is easy to program thanks to its intuitive user interface, and it tells us at a glance whether good or bad parts are being produced," Klaus König notes.

Innovative technology from Kistler points the way to the future
40 million probes are manufactured each year on the production plants at INGUN's facility in Konstanz. Depending on the shift pattern, this means that each machine produces between 3 and 8 million probes. To reliably achieve such high production volumes, all the machines have to run at extremely high speeds with precise synchronization. High capacity utilization of the plants plays a key part in the commercial success of the entire enterprise.

So that frequencies can be increased even further, INGUN's development department is considering complete integration of quality assurance within the value creation process as a longer-term objective. Again, piezoelectric sensors from Kistler offer the crucial basis for this development: these instruments are tiny, and the force is applied to an extremely small area – but even in very confined spaces, they deliver high-precision measurements with excellent repeatability and high resolution. At the same time, these rugged sensors are protected against overloading even in case of high frequencies – so they have longer lifetimes than other sensors.

Thomas Schrodi gives an extremely positive assessment of the firm's partnership with Kistler: "The specialist advice and technical support we receive from Kistler have helped us enormously, time after time. Since we ourselves sell testing equipment, it's absolutely essential that our products too are 100% tested to the very highest standards of quality. Kistler's full range of services provides us with a dependable basis to make sure this happens. And this much is clear: we can only maintain our number one market position in future by supplying products of outstanding quality."

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Kistler Group
Eulachstrasse 22
8408 Winterthur
Switzerland
Tel. +41 52 224 11 11

Find your local contact on
www.kistler.com

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