



Process monitoring for highly automated production

Schurter relies on measuring technology from Kistler to achieve $100\,\%$ -control and traceability of safety critical parts





Every hour, about 3 000 electrical fuses are produced on the new plant

Swiss electronics manufacturer Schurter AG has to meet the demanding standards set by the automotive industry, so 100 % control and traceability are essential requirements in its production process. Schurter's new fully automated plant to produce complex safety-critical parts incorporates four Kistler systems for force-displacement monitoring – including fast cycle times, automatic sorting and measuring instrument capability testing.

Schurter, the Lucerne-based Swiss electronics manufacturer, has ambitious plans for the future: with a workforce that already numbers over 2 000, 11 production facilities and companies in 17 countries, the stage is clearly set for growth to continue. Acquisitions are generating added impetus; turnover already amounted to CHF 259 million in 2017, and the trend is upwards. Schurter's portfolio has two cornerstones: electric/electronic components (connectors, switches and circuit breakers, etc.), and input systems such as HMIs, touch panels and membrane keypads. Recent years have seen the addition of custom solutions based on a high level of vertical integration: these are grouped together in the firm's Solutions division.

As the trend towards electromobility gathers pace, electric fuses are now taking on a key role – especially in the production of batteries for electric automobiles. Each battery cell requires individual fuse protection, so the total number of fuses in a vehicle can quickly reach four or five hundred. In 2017, an end customer in the automotive sector commissioned Schurter to produce large quantities of fuses for use in safety-critical areas. André Schürmann, Head of Automation & Maintenance at Schurter, explains the background: "We can draw on many years of experience in automating fuse production processes. And thanks to our technological edge, we're still able to carry out the development work here in Switzerland, as well as some of the production. That's something our customers really appreciate." The fuses consist of numerous small parts; large quantities have to be manufactured with maximum automation, in compliance with the standards and of course with high quality. To meet these exceptional challenges, Schurter invited a near neighbor to come on board: special-purpose machinery manufacturer ROBO • MAT AG. "ROBO • MAT presented us with a very detailed offer for the development of the plant, including a 3D layout and exact pricing. Combined with their physical proximity and the close working relationship that



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Markus Zimmermann, owner and CEO of ROBO • MAT (right), André Schürmann, Head of Automation & Maintenance at Schurter (middle), and André Signer, Sales Engineer at Kistler (left) SCHURTER Holding AG, Werkhofstrasse 8-12, 6002 Luzern, Switzerland

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Four Kistler maXYmos BL process monitoring systems are installed in Schurter and ROBO • MAT's new fully automatic plant (on the left of the picture)

developed from day one, this added up to a highly convincing complete package," Schürmann recalls.

High-precision testing in seconds

Markus Zimmermann, owner and CEO of ROBO • MAT, explains the project: "Two fuse variants are produced on this plant, at rates of about 3 000 parts per hour and with a cycle time of 2.7 seconds. The product passes through 16 different stations in that brief period of time. Designing the plant faced us with the challenge of coordinating the process steps so as to achieve the short cycle time. The beauty of it was that Schurter hadn't yet finalized the fuse design when we started work. This meant that special requirements could still be incorporated into the design. Of course, that's only possible if you're close enough to the customer," Zimmermann stresses.

Kistler's force-displacement monitoring systems were chosen to meet the demanding requirements for traceability and quality in the automotive industry. A total of four Type 9217A piezoelectric small force sensors are deployed in the new plant, together with the matching maXYmos BL evaluation systems. "As well as our favorable experience in the past, the main factors that persuaded us to opt for Kistler were the small force range and the very low response threshold," Zimmermann notes. The measured key variables are recorded and visualized during the process; in addition, the defined criteria are used for automatic in-process segregation of good and bad parts. Testing includes the spring force as well as the force applied to position the covers on the fuses. The sensors themselves are also tested: "What's really special about this plant is that the measurement equipment itself is cross-checked during the actual process. The sensor technology is measured about once in every 100 parts - to verify whether the sensors are still

capturing the data that they should," Zimmermann continues. "This development is driven by requirements in the automotive industry. According to the International Automotive Task Force's standard IATF 16949 for safety-critical parts, the capability of the measuring equipment has to be verified regularly during the production process. The end customer specifically audited this particular point here in our plant," Schürmann adds.

An unprecedented level of quality data acquisition was attained in response to this combination of demanding customer specifications, compliance with the standard and a highly complex plant: "For each fuse, 76 specific datasets are captured and stored in one central database – as well as force and displacement, the data covers many other variables such as furnace and air temperature. This is the most extensive acquisition of quality data that we have ever implemented on one plant," Zimmermann points out.

Schurter and ROBO • MAT have thus met all the specified requirements for quality assurance and documentation, so now they can focus on optimizing the operation of the plant.

Intuitive measurement technology generates added value

There is still some way to go before series production can finally begin. Acceptance was already obtained from the end customer after about a year of development work, but that is not the same as the 24/7 volume production targeted by Schurter. Phase two is therefore focusing on intensive testing and optimization of critical factors such as materials, plant settings and other parameters. "The measurement technology didn't need very much effort because the systems can be operated intuitively," Schürmann notes. "We've already used Kistler products in the past, so we know we can rely on performance, service and value for money," Zimmermann adds. "But other parts of the plant are so complex that commissioning and optimization involve a substantial workload. The advantage is that once the target has been attained, the settings are transferred directly to a second plant so we can cover the planned high quantities," Zimmermann continues. maXYmos and the rest of Kistler's technology will be on board again at that stage, with double testing to ensure that the fuses keep their promises.

Zimmermann concludes: "We appreciate the excellent collaboration, the professional support and Kistler's close relationships with its customers – and we shall be glad to choose Kistler again in the future." Schürmann sketches out the prospects for the future: "Plants will have to become more and more intelligent to meet the challenges posed by e-mobility and Industry 4.0. Condition monitoring, predictive maintenance and batch-level traceability are increasingly becoming part of the standard. This calls for measurement technology that can be integrated easily and operated intuitively – and it has to deliver precise and reliable results. In-process quality monitoring definitely generates added productive value, which is why growing numbers of industrial manufacturers are integrating it into their production."

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