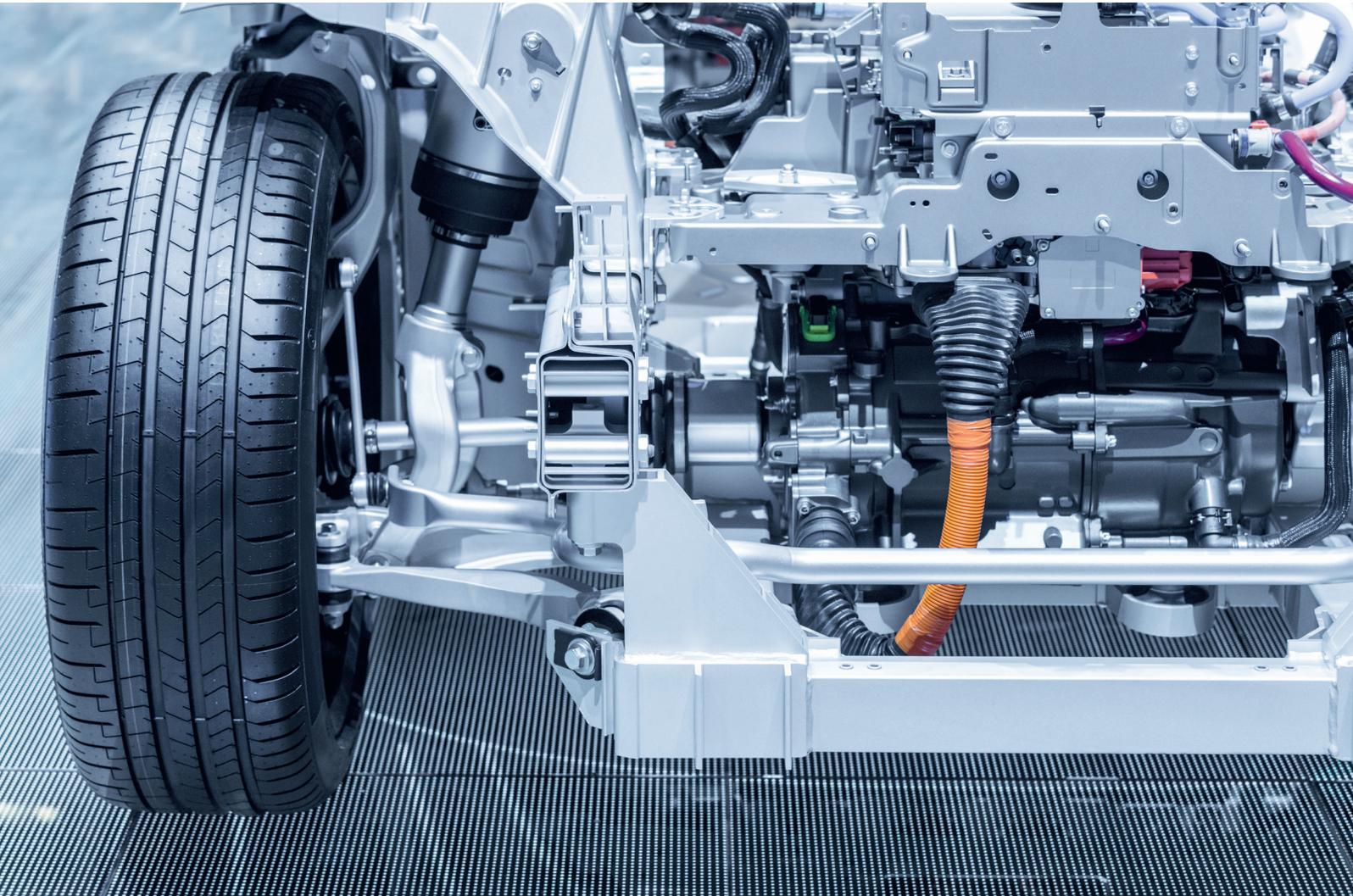


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## Manufacturing cells with integrated measurement and testing technology

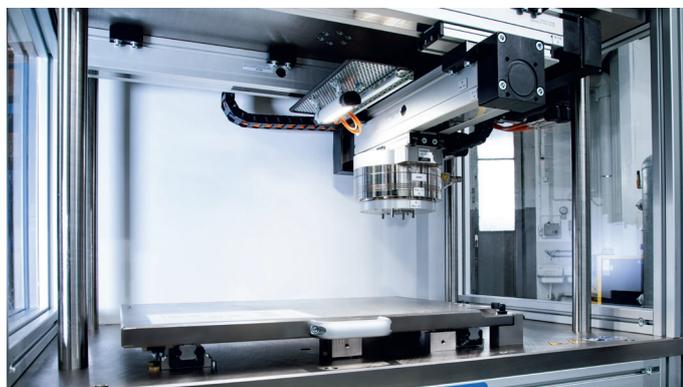
Smart Single Stations by Kistler: from manual to fully automated workstations



Single cells, semi-automated or fully automated, with integration if desired: Smart Single Stations from Kistler with built-in measurement and testing technology ensure optimized production processes.

**Turnkey solutions from Kistler for assembly and testing processes: integrated measurement technology know-how for industrial production, tailored to each user's individual requirements. These manufacturing or testing cells are designed exactly in line with customers' specifications. Depending on how complex the requirements are, they can be operated as simple single cells, semi-automated single cells or fully integrable automated cells.**

Industrial production processes in sectors such as automotive, electronics or medtech often have to comply with the highest quality standards. Manufacturers must also conform to additional requirements for sustainability, traceability and efficiency that can only be met with advanced production technologies. Components and systems equipped with measurement technology are the key to improving production processes such as part joining and press-fitting, or end-of-line quality testing – and they also make these processes more transparent.



Semi-automated Smart Single Station by Kistler with XY positioning and a rotatable stamping tool to assemble semiconductor elements (IGBTs)

Kistler offers these solutions not only as single products or modules, but also as customized turnkey solutions – known as Smart Single Stations (SSTs). They are used in any situation where precise, quality-assured and traceable production processes play a critical part. Smart Single Stations can be used to perform a vast range of assignments – and in many cases, flexible and energy-efficient electromechanical joining systems from Kistler are integrated into the solution. Here are three examples of SST applications:

- Manual workstation in a test line for electric motor production
- Complex circuit board assembly for an electric pickup vehicle
- Complete line production of valve islands for an active brake system

**Highly individualized manual workstation for prototype production**

A major European manufacturer of utility vehicles commissioned Kistler to supply a high-caliber customized manual workstation for its electric motor production. Its function: press-fitting of various rotor stacks onto a shaft. This application uses a special angled version of the NCFN NC joining system from Kistler with a high nominal joining force of 400 kN. To ensure ergonomic loading and unloading of the cell, the solution integrates a motorized precision-movable table that can accommodate components weighing up to 75 kg. "We also had to come up with solutions for a whole series of challenges in response to the safety and design specifications requested by our customer," says Wadim Weber, Sales Engineer for Smart Single Stations at Kistler. "An additional force transducer was integrated to cope with small forces and also to act as a reference sensor. What's more, the system features a handheld electronic scanner – so the measurement programs for the different rotor stacks can be called up directly from the maXYmos NC process monitoring system."

Once the shaft has been assembled successfully, the measurement results and production data are transmitted from Kistler maXYmos to the customer's MES. The system includes a customer-specified industrial PC that not only visualizes the process data from maXYmos, but also handles direct analysis of measurement data and can be used for other applications as well. Weber adds: "Due to factors such as the level of detail and the demanding safety and quality requirements for this project, a period of around one year was needed from receipt of the order to commissioning in the manufacturer's prototype production department."

### Complex semi-automated circuit board assembly

In this case, the customer was a U.S. company that is driving ahead the electrification of the pickup trucks that are so popular in America. Kistler supplied a complex semi-automatic system to assemble semiconductor elements (insulated-gate bipolar transistors, or IGBTs). A process known as cold welding is used to permanently join a total of seven components of different types to the circuit board. "Following manual insertion, the individual positions are approached automatically so the joining processes can be performed with high precision and reliability," according to Klaus Hoffmann, SST Product Manager at Kistler. He continues: "The joining module had to be movable in the X and Y directions, and the tool had to be rotatable through 90 degrees. We implemented both these requirements exactly according to the customer's specifications. The operator simply has to remove the automatically assembled board at the end of the process."

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**"Thanks to this combination of a manual workstation with sophisticated process automation, we did a very successful job of meeting the customer's requirements for repeatability, precision and efficiency,"**

**Klaus Hoffmann, SST Product Manager at Kistler**

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To maximize the system's operating efficiency, an open design was chosen for the work area and two light barriers were installed for protection. The work surface is equipped with appropriate fixtures, and it can be retracted and extended with a handle to make assembly easier. "Thanks to this combination of a manual workstation with sophisticated process automation, we did a very successful job of meeting the customer's requirements for repeatability, precision and efficiency," Hoffmann adds.

### Fully automated production of bonded rotors

In order to achieve short cycle times, multiple Smart Single Stations can be combined to a complex line so that several process steps can be carried out in parallel. Kistler is currently designing a machine network with several bonding presses for a fully automated production line of an automotive manufacturer active in the field of e-mobility:

In a network of 12 Smart Single Stations for the rotor production of an EV main drive, rotor laminations and magnetic cassettes are bonded together according to precise specifications regarding temperature profile and holding pressure.

Michael Klingele, Team Leader Sales Factory Automation at Kistler, explains: "A total of 12 electromechanical joining systems are used to manufacture up to 12 rotors simultaneously. The rotor laminations and magnetic cassettes are applied with an adhesive in an earlier process and stacked on the rotor shaft.



This Smart Single Station from Kistler is used as a manual workstation for press-fitting rotor stacks with high joining forces. Features include a movable table, safety door, handheld scanner and IPC.

A 6-axis industrial robot then feeds the stack to the Smart Single Station, where the adhesive is bonded under pressure and heat. The rotor stack is pressed together under constant pressure by the electromechanical joining spindle and heated by a specially designed inductor. The heat generated in the station is dissipated by a liquid cooling system and transferred to a central cooling system."

In this case, the combination of several Smart Single Stations enables simple industrialization of the production process in order to fulfill the high requirements of the automotive industry in terms of cycle time and quality.

### Flexible production technology – exactly as customers want it

Kistler's Smart Single Station concept is not limited to joining processes such as press-fitting, clinching, riveting or similar operations. In particular, optical testing technology can also be integrated flexibly into these systems to perform quality assurance: in this case, parts are inspected with the help of high-resolution cameras and the KiVision software from Kistler to ensure compliance with the highest quality standards – up to and including zero-defect production. Other technologies can also be integrated on request to create turnkey systems that meet customers' individual requirements: examples include automated fastener testing, e-motor testing and industry-specific process monitoring solutions for semiconductor production or medtech applications – to name only a few.

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