

Technical Report

Cost-effective force measurement with DSRT strain sensors. Salvagnini relies on Baumer.

With the P1 panel bender, the Italy-based Salvagnini has set new standards on the metal forming market. The P1's innovative bending kinematics open up new applications that go far beyond traditional bending. The revolutionary MAC 2.0 technology detects material variations during the bending operation and automatically compensates. This reduces waste, resulting in permanent, constant quality, optimized production times and maximum productivity.

For 50 years, the Salvagnini Group has been designing, producing and selling machines and flexible systems for processing panels: punching centers, panel benders, press brakes, fiber lasers, FMS lines, automatic sheet stores and software. The machines are used for example in the production of luminaires, elevator and heating boiler panels, control cabinets and metal furniture. With four production plants, 23 branches and 30 service centers in 75 countries, the company offers reliable, durable and adaptable solutions worldwide.

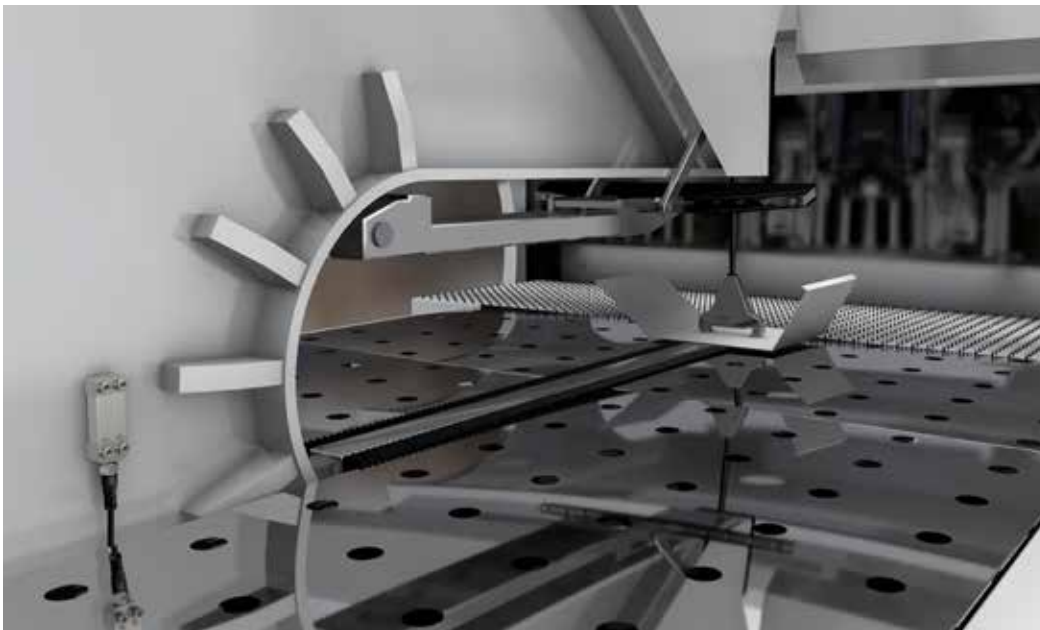
At its Ennsdort plant in Austria, Salvagnini produces about 100 fully automatic bending machines for the panel processing industry, including the P1 electric panel bender. With space requirements of only 8 m², an average energy consumption of 3 kW and an affordable price, it is Salvagnini's answer to the market's rising economic and ecological demands.

Fine-tuned bending process

The bending unit is the operative heart of the panel bender. It consists of the bending beam



The fully electric P1 panel bender from Salvagnini produces top quality bends, sustainably and cost-effectively.



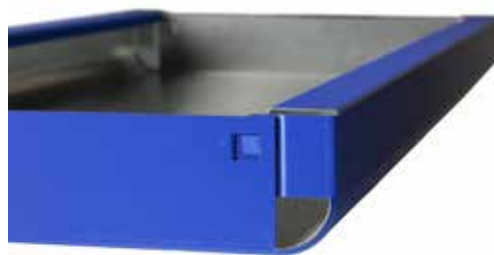
In the manipulation unit, the DSRT strain sensor safely and reliably monitors and controls the panel holding force.

carrier with the upper and lower edging tools, the sheet metal downholder, the support bracket and the manipulator. For the bending process, the manipulator moves the metal sheet into the desired direction, and moves the side of the work piece to be edged into the right position in front of the bending unit. The downholder clamps the sheet and holds it firmly during the entire process. In controlled path movements, the bending beam performs a rapid succession of edge bending operations, upwards or downwards. Unlike traditional press brakes with only one angle size, the P1 panel bender with patented bending kinematics can create angles and arcs of different sizes and diameters, depending on the setting. This allows multi-sided production of profiles, panels and other semi-finished products.

The challenges of holding force, pressing force and bending force

The efficient P1 panel bender performs a bend in less than two seconds with just one tool. In the process, different forces act on the workpiece. These must be set exactly and measured reliably.

The pressing force of the manipulator must not be too great. Otherwise this leads to marks on the panel. At the same time, its holding force must be sufficient to move the workpiece reliably at the greatest possible speed, without it slipping. A DSRT strain sensor mounted on the machine frame copes effortlessly with these apparently conflicting requirements. Compared to



An example of a challenging semi-finished product with different angles and arc diameters.

many strain sensors on the market, it is very gentle, reacts fast and can accurately detect even the slightest elongation or compression.

It also shows its strengths to the fullest in monitoring the force of the bending beams. Depending on the angle, the beams apply more or less force when forming the workpiece. This force is predefined in all cases and must not exceed tolerance limits over the entire cycle. The DSRT provides long-term stability. Once it has been set, it ensures continuous angular accuracy in all measurements. For quality purposes, the measured values can be logged.

Thanks to new MAC 2.0 technology, good bending results are no longer dependant on material quality. During the utilization time, the DSRT strain sensors monitor the quality of the panels to be processed. If they detect discrepancies in excess of tolerance limits, they trigger adjustments in the movements of the bending beams. This automatically compensates for irregularities in the material.



In the bending unit, the DSRT strain sensor monitors the material characteristics of the work pieces throughout the entire process.

Solution

"With the universal DSRT strain sensors by Baumer, we have found the ideal components for our innovative bending machines", confirms Peter Mascher, Engineer and Head of Electrical Engineering at Salvagnini. "We are very satisfied. We can cover several applications with just one sensor. This keeps our costs low for procurement and logistics. It does not have to be adapted to the design of our machines, but can simply be bolted on at the ideal location. This saves us time in development, installation and service, so that we can pass on all these advantages to our customers."

The unique mechanical construction of the sensor is designed to influence the machine structure as little as possible. This allows excellent measurement results, as well as reliable and precise process control. The sensors are available with different measuring ranges from 100 $\mu\epsilon$... 750 $\mu\epsilon$ and the output signals feature voltage output of ± 10 DVC, passive and CANopen interface.

Further information:

www.baumer.com/force-and-strain

www.salvagnini.com



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