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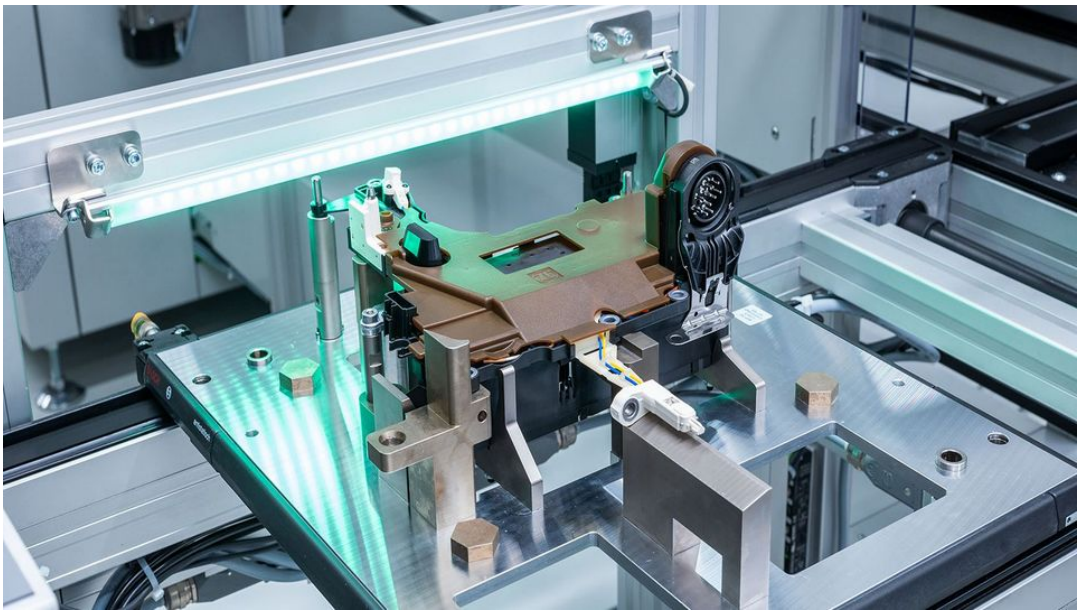
ZF relies on a diode laser from TRUMPF for plastic welding

The soundest seam in plastic welding—that's what ZF Friedrichshafen is striving for. A diode laser equipped with a pyrometer delivers the results, and all the process data as well.

The safety of the transmission control unit in the ZF's new lightweight eight-speed automatic transmission hinges on a plastic cover's 22 welding ribs. This unit does an impressive job of shifting the engine's power to the wheels in midrange sedans, luxury sports models and SUVs. These power electronics are sensitive, however, so if any metal chips or debris find their way into that control unit during assembly or operation, the motoring fun is sure to be finite. That's why engineers put a lid on it. So how do you make sure all those seams on the plastic are tight? Patrick Czekalla, project engineer at ZF's Plant Engineering department at Auerbach, has the answer: "We weld with a diode laser and monitor with a pyrometer." This device is built into the TruDiode's laser control system.

A view into the melting zone

The pyrometer measures the melt temperature in real time precisely where the parts join. The laser control unit registers the intensity of the thermal radiation in the specified wave- length spectrum and, if necessary, adjusts the laser power to the target temperature. "External pyrometers always lag a bit behind the laser beam," says Czekalla. "The built-in system gives us more reliable measurements and we can be sure that the cover is properly welded to the assembly." This makes it easier to spot flaws: for example, a change in heat absorption is a telltale sign of a stranded wire trapped between the base module and the cover. "One big advantage is that we can detect flaws during the lasering process. And now we only have to perform destructive tests when the job order is approved," says Czekalla.



The brown plastic cover is welded to the transmission control unit with 22 welding ribs.

In writing, please

ZF manufactures the transmission control units on specially designed lines at plants at Auerbach, Bayreuth, and in the Czech Republic. It's good to know that the welding is done properly, but that insight alone is not nearly enough in today's automotive industry. Traceability of all products has long been compulsory for all process steps, modules, and lines. That's why collecting and assessing manufacturing data has been a top priority at ZF for years. "Data analysis helps us set and continuously optimize process limits," says Czekalla. "But it also helps us fulfil an obligation to our customers." The TRUMPF TruDiode laser has the interfaces needed to connect to databases. This makes it possible to capture and store all the parameters that are critical to the process in a quality assurance database. "We record the exact date and time when each transmission control cover was produced, and in which facility. The laser's other process-critical parameters are also captured. A laser later adds all this data to a data matrix code on the product," notes Czekalla.

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