



WELDING OF FLEXIBLE COPPER CONNECTORS FOR HIGH-CURRENT APPLICATIONS

Task

As automobiles become increasingly electrified, the demand for efficient energy storage systems is growing. So that maximum flexibility of form and performance for the modules and battery packs can be ensured and high currents transmitted safely, a flexible and low-loss interconnection of the energy storage devices is required. As part of the publicly funded project »FlexJoin« (Reliable system and joining technology for flexible production of battery modules), a laser-based bonding and joining process for aluminum and copper arresters with contact cross-sections of $\geq 500 \mu\text{m}$ in thickness and up to 10 mm in width shall be built and integrated into a machine system.

Method

For secure joining of thick and wide ribbons on battery cells and lead frames, a robust laser joining process was first developed and the required technology integrated into a conventional bonding machine. The wire bonder modified in this way is equipped with a fiber laser, a Z shifter for adjusting the focus position in the vertical direction, a galvanometric

scanner for beam deflection in the X-Y plane and a beam guiding and specially developed focusing unit. The system technology allows automatic feeding, positioning and contacting of the flexible connector on the battery or the lead frame.

Results

The described optical elements and systems for process monitoring have been integrated into the system technology. Copper connectors up to 10 mm wide and $500 \mu\text{m}$ thick can be guided and safely and reproducibly joined to different materials.

Applications

The laser bonder can be used in broad areas of power electronics in high-current applications and battery technology. In particular, it can be used wherever fast and flexible contacting solutions are required.

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Contact

Johanna Helm M.Sc.
Telephone +49 241 8906-8382
johanna.helm@ilt.fraunhofer.de

Dr. Alexander Olowinsky
Telephone +49 241 8906-491
alexander.olowinsky@ilt.fraunhofer.de

1 *Welded copper connector (0.5 x 10 mm²) on 18650 battery cells.*

2 *Positioning unit of the prototype laser bonder.*