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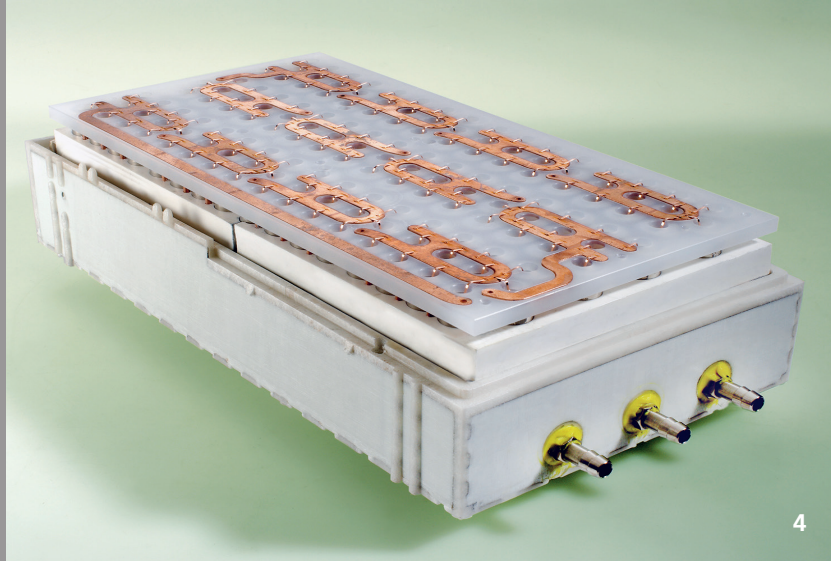

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LASER-BEAM MICRO JOINING OF CYLINDRICAL BATTERY CELLS

Task

As the pressure on cities increases to reduce exhaust pollution, so too does the demand for alternative automotive drive concepts. Electromobility is an approach to solve this issue, but is still expensive and not efficient enough. As a central and costly component of electric cars, the battery cell and its connection to battery systems are the focus of this research. Joining processes with a high degree of automation and a low process time are required to electrically contact individual battery cells, such as type 18650 or 21700 cylindrical cells. At this point, brilliant laser beam sources for welding cells to cell connectors can offer new highly automated manufacturing solutions.

Method

In the »OPTEMUS« project, Fraunhofer ILT is developing core battery module technologies for electromobility to reduce manufacturing costs and, at the same time, to increase efficiency. A subproject deals with the development of a battery module that can store and provide not only electrical, but also thermal energy. At Fraunhofer ILT, a laser-based joining technology has been developed for contacting the battery cells with minimal energy input and component load.

Results

The battery module consists of 144 round cells (model 18650) with 12 parallel and 12 serial levels. The cells are welded to a 0.2 mm thick sheet (CuSn6) at the negative pole. For this purpose, a single-mode fiber laser is used in combination with local power modulation. In this case, the feed movement is superimposed with a circular oscillation movement so that the weld geometry can be adjusted as needed. The positive pole of the battery cells is contacted by means of laser bonding (laser beam welding with automatic ribbon supply) on a bus bar.

Applications

Laser-beam micro-joining is suitable for contacting different battery formats (pouch, prismatic and round). The advantages are the low and controlled energy input into the thermally sensitive battery cells as well as the high degree of automation of the process.

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3 Submodule with 12 battery cells (type 18650).

4 Battery module consisting of 12 submodules.