



PROCESS MONITORING FOR LASER WELDING OF HIGH-CURRENT CONTACTS

Task

Laser welding is increasingly being used to contact battery cells and thus create complete modules or packs, as well as to electrically interconnect components of power electronics, a situation accelerated by advances in electromobility. A critical problem in such applications, however, is when individual connections are faulty, thereby reducing the capacity or peak power of the battery packs. In addition, a continuous documentation of the production chain is required in the automotive sector.

Method

Fraunhofer ILT has developed a process monitoring module for scanner-based laser welding of electrical contacts. In this process, the connector is pressed with a pressing tool at a defined force on the lower joining partner. During the joining process, a galvanometer scanner guides the laser beam to produce the desired weld geometry while a pyrometer and a coaxially integrated camera monitor and record this process. This sensor module checks whether the temperature of the welding process is within the tolerance range and whether dangerous short-circuiting splashes occur during the process. After the process, the weld seam geometry can also be measured with the camera and its shape evaluated.

Results

To demonstrate the scanner-based laser welding process with process monitoring, Fraunhofer ILT has set up a system with relay optics already used industrially in this process for constricted production areas. With the aid of process monitoring, process deviations can be reliably detected and every weld documented. The system was evaluated as part of a demonstration on a robot for a flexible production line.

Applications

The processing head with process monitoring can be used, for example, for micro laser welding processes that connect the contacts of energy storage devices and components of power electronics. The process monitoring included can be used for documenting each weld, which meets the requirement set by the automotive industry of a fully documented processing chain. In principle, the process monitoring module can also be used for other scanner-based laser processes, such as structuring or fine blanking.

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- 3 Camera image of coaxial process monitoring.
4 View of the processing optics with process monitoring.