



## PROCESS MONITORING DURING LASER WELDING OF BATTERY ELECTRODES

### Task

When battery modules for electric vehicles are assembled, plate-shaped power contact rails are connected with the terminals of several battery cells. Large electrodes and weld cross sections are employed according to the magnitude of currents to be conducted. An important prerequisite for reliable production technology is to guarantee a constant penetration depth and a faultless joint. Suitable process monitoring should be employed to reach this objective: reliable laser-beam welding of battery electrodes.

### Method

To generate the contacts of the battery electrodes, Fraunhofer ILT expanded a laser plant by a coaxial imaging process monitoring system in order to record the melt pool and, thus, the secondary process radiation during welding. As part of the process development, suitable process parameters were initially determined to generate good bonding of the contacts. Based on the initial parameters, a specific variation of the process parameters was carried out to determine how fluctuating input variables correlate to changes in the welding depth.

1 Demonstrator model of the monitoring system.

2 Longitudinal section of a weld seam at a constant depth in copper sheet.

### Result

A prototype system that collects relevant data from the welding process has been successfully demonstrated. Besides containing an industrial PC for operation and data acquisition, this prototype also uses an embedded PC with PLC software to delay critical electrical signaling. With this system, the detected melt pool in the welding process can be correlated with the welding depth. Furthermore, the correlation of the weld depth with the measured radiation power of the radiation process could be validated. In comparison to process monitoring by imaging this method requires more effort to adjust the optics.

### Applications

The method can be used both in critical safety connections of battery terminals as well as in all other lap welds.

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