



NOVEL LOCAL POWER MODULATION FOR LASER MICROWELDING

Task

Innovative process approaches are needed to reduce metallurgical defects when dissimilar materials or aluminum alloys susceptible to hot cracking are welded together. In these cases, temporal and spatial power modulation can be used to control energy input in the joining zone, thus enabling a precise and efficient welding process.

Method

To reduce hot cracking during welding of aluminum alloys, for example, the magnesium mass fraction in the melt pool must be adjusted. Targeted local beam modulation can be used to set different heat distribution and accumulation in the joining zone. In this way, the evaporation of magnesium in the melt can be reduced or increased. For this purpose, the function of galvanometric scanner is advanced in such a way that it can trace a 360° rotatable geometric form of a digit "8."

Results

The novel local power modulation extends the degree of freedom of conventional local power modulation with circular oscillation (wobble) by additional adjustment factors: The two separately adjustable amplitudes and rotational speeds of the individual circuits of the "8" influence the melt pool dynamics and the temperature distribution.

Applications

This local power modulation can be used for different welding tasks for batteries as well as capacitors. In particular, mixed joints can be improved using this approach.

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1 Weld seam made with novel local power modulation.

2 Measured beam modulation by means of PSD measurement.