

High Brightness Fiber Lasers for E-Mobility Applications

N. Reinermann¹, M. Grupp¹, M. Thompson²

1- IPG Laser GmbH, Carl-Benz-Straße 28, 57299 Burbach, Germany
2- IPG Laser GmbH Hawkfield Way, Bristol, BS14 0BY, United Kingdom

Corresponding author: nreinermann@ipgphotonics.com

The change in the automotive industry from combustion engines to the electrical powertrain requires new innovative joining technologies. The use of copper and aluminum in electric motors, batteries and in electric power transmission lines creates new challenges in processing highly reflective materials in significant volumes.

Copper and Copper alloys had proven to be challenging to be welded with near infrared lasers, because of the lack of optical absorption and other physical properties. With the availability of high brightness, low cost fiber lasers these issues are overcome. Very high power density leads to an immediate melting and creation of a laser keyhole which significantly increases the absorption compared to the solid material. With adapted process technologies such as high dynamic beam deflection the welding process becomes stabilised and spatter and blowholes are minimal. With these new technologies, stable welds with excellent physical properties for strength and conductivity are readily achieved.

In battery production a further challenge is the dissimilar materials combination. Risks of cracking and low tensile strength issues with dissimilar material joints, such as Cu-Al are eliminated, utilising strategies to mitigate intermetallic phases.