

APPLICATION NOTE

Automotive Battery Busbar Welding

Introduction

For automotive applications, numerous individual batteries need to be electrically connected by busbars to drive electric motors. Laser welding is an established process for this application because it delivers high throughput and reliability.

Process

The goal here was to weld dissimilar metals - nickel coated, copper battery tabs to 1000 series aluminum busbars. The weld configuration was an overlap joint. The total thickness of the 3 copper tabs was 0.6 mm. A Coherent HighLight FL1000CSM single mode fiber laser was employed, in combination with a Coherent SmartWeld+ process head. The SmartWeld+ process head uses a scanner to oscillate the beam, producing the required weld cross section for good electrical connectivity. The SmartWeld+ process head offers a range of standard oscillation patterns, plus user configurable patterns. Here, a standard "figure 8" pattern yielded the best results. Controlling weld penetration into the aluminum base material was critical here in order to get a deep enough weld for sufficient mechanical strength and electrical conductivity, but not so deep as to create excessive brittle intermetallic phases. The effective linear weld speed of 2.5 m/s at 500 W laser power met customer throughput requirements.

Results

The Coherent single mode fiber laser and SmartWeld+ processing head delivered crack-free welds with limited porosity. The "figure 8" pattern, with an amplitude of 0.5 mm, produced the customer specified >1.0 mm wide weld cross sections. Tensile strength tests showed that the weld penetration and the control of the intermetallic phases was sufficient to get the specified shear strength of >1750N for a 20 mm long weld.

Application Field

Busbar welding, battery welding, dissimilar material welding.



Figure 1. HighLight FL1000CSM Single Mode Fiber Laser



Figure 2. SmartWeld+ High-Precision Laser Processing Head for Micro Welding Applications

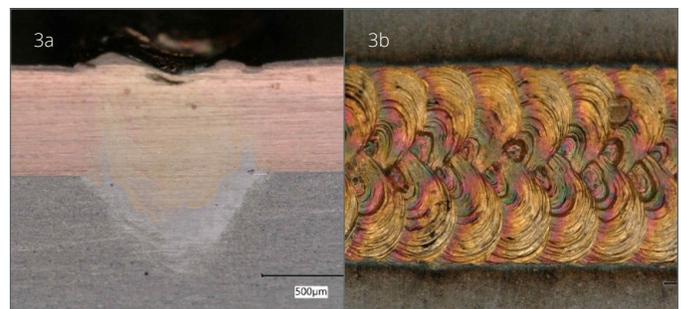


Figure 3. Cross section of nickel-coated copper battery tab welded to 1000 series aluminum busbar (Figure 3a). Top view (Figure 3b).

Contact

Coherent Applications Lab: Santa Clara, CA
Email: applslab@coherent.com