Laser Welding of Dissimilar Metals

In order to produce mechanically stable connections between different metallic materials, cw-laser welding and laser brazing is performed. In order to reduce the amount of intermetallic compounds, the welding depth and the joining width have precisely adjusted.

APPLICATIONS
Automotive, connection technology, lightweight construction

TECHNOLOGIES
Laser beam welding, laser brazing

MATERIALS
Metals (AlMg3, 1.4301, Ni42, Inconel, Cu)

KEY FACTS
- Continuous-wave laser welding of different metallic materials
- Minimization of the welding depth to reduce intermetallic phases
- Laser brazing of different metallic materials

PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>P_{max}</td>
<td>1200 W</td>
</tr>
<tr>
<td>v_{max}</td>
<td>10000°/min</td>
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</table>

ACKNOWLEDGEMENTS

This project under the name of “AlDi” is funded by the Federal Ministry of Economics and Technology (BMWi) and the “German Federation of Industrial Research Associations "Otto von Guericke" e.V. (AIF).
The main aim of the research work is to develop a powerful concept for joining metal foam sandwich constructions. Metal foam sandwich constructions have good properties concerning lightweight construction, vibration and damping, fire resistance and insulating properties against noise and electromagnetic radiation.

APPLICATIONS
Shipbuilding

TECHNOLOGIES
Laser beam welding and cutting

MATERIALS
Steel, aluminum foam

KEY FACTS
- New applications in the shipbuilding industry for large-scale, steel-aluminum foam sandwich constructions
- Characterization of welded specimens using non-destructive and destructive material testing methods
- Transfer to and implementation of the results on real shipbuilding components
- Key applications of the new development are highly stressed ship structures and ship structural components such as engine beds, rudder structures (shell and core), or security doors
- Development of a laser cutting process for sandwich constructions with a thickness up to 25 mm

PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td>Different laser sources</td>
<td>up to 5 kW</td>
</tr>
<tr>
<td>Feed rate</td>
<td>up to 3 m/min</td>
</tr>
<tr>
<td>Steel plate thickness</td>
<td>2, 3 and 5 mm</td>
</tr>
<tr>
<td>Sandwich thickness</td>
<td>up to 25 mm</td>
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</tbody>
</table>

ACKNOWLEDGEMENTS
This project “Meschlas” is funded by the German Federal Ministry of Economics and Technology (BMWi)
Laser Welding of Steel and Aluminum

This exhibit shows the possibility of welding steel and aluminum. With a higher number of linear welding seams, the tensile strength can be increased. The welding seams are produced using on-line monitoring to control the weld depth.

APPLICATIONS
Automotive

TECHNOLOGIES
Laser beam welding, process monitoring

MATERIALS
High strength steel, aluminum alloys

KEY FACTS
- New and innovative laser welding concepts
- Development of a laser beam head with an integrated inline process monitoring
- Controlled and controllable penetration depth in aluminum to reduce intermetallic phases
- Connecting surface of the seam can be increased by laser beam oscillation in feed direction, which leads to an increased strength

PARAMETERS

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<th>Parameter</th>
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<td>Feed rate</td>
<td>&gt; 3 m/min</td>
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<td>Spot size</td>
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<td>H340LAD</td>
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<tr>
<td>Aluminum alloy</td>
<td>AW 5168</td>
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</table>

ACKNOWLEDGEMENTS
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