

New method for laser beam welding of die cast aluminium

Fraunhofer IWS Dresden has developed a new method for welding parts made of die cast aluminium and has begun mass production together with an industry partner. With the help of a brilliant laser beam and high-frequency beam oscillation, for the first time it was possible to generate a welded joint with extremely low pore frequency in the weld material. Moreover, distortion of the part, caused by concentrated local introduction of heat, is so minimal that it is hardly measurable. This kind of quality cannot be realized with conventional laser beam welding.

Because of its outstanding castability and the ability to create complex shapes, aluminium die casting is used in a variety of ways in automobile manufacturing, particularly for thin-walled cross sections. Often the cast components include openings intended for profile or tube products, which usually require a pressure tight connection when put together. Here it is necessary for the joining method to be as efficient and cost-efficient as possible. Beam welding methods are predestined for such demanding connections, and laser beam welding in particular.

Because of the production process, die cast components range from difficult to impossible to weld. Gases sealed inside during the process, which occur as bubbles or pores, are under high pressure and the mould separating agents from the die casting process are not suitable for forming a homogenous weld seam either. Generally pore formation and discharges increase in the weld material, which hinder the use of the part. Through the use of beam sources with the highest in beam quality and the use of high-frequency beam oscillation in the molten bath Fraunhofer IWS was able to considerably improve the quality of the weld seam. Thanks to its high level of reproducibility, a joining method is now available with high component output for mass production.

Laser beam welding has found wide industrial use in mass production. Laser beam welding methods with integrated short-term heat treatment, with additional materials adapted specifically to the material, and newly also with high-frequency beam oscillation make it possible to manufacture crack-free weld seams from temperable and high-strength steels, cast iron, aluminium alloys and special alloys, alloys prone to hot cracking, as well as parts with high rigidity.

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