Highlight

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New prototype machine for polymer laser welding featuring a highly variable LCoS beam shaping system

A highly variable beam shaping systems allow user-defined modifications of shapes, sizes and intensity profiles of laser beams. A new prototype machine developed in the Polybright project features such a system and can therefore cover a wide application area in the field of laser polymer welding. Contour and quasi-simultaneous welding with a desired spot size and optimized intensity profile as well as simultaneous welding with a customer-specific beam contour can be applied in only one machine; laser beam shaping is carried out within seconds.

Figure 1: Prototype machine featuring a highly variable LCoS beam shaping system

Figure 2: Sample showing simultaneous welding (cup) and contour welding (matrice) with different spot sizes realized within a single scanner run

Beam shaping techniques for polymer laser welding are part of the Polybright project. The techniques cover refractive and diffractive methods in order to improve the process performance of laser polymer welding. One of these techniques is based on a highly reflective liquid crystal on silicon (LCoS) device on which a computer generated hologram can be monitored. Consequently, an incident laser beam affects a specific diffraction resulting in a desired beam shape and intensity profile on a work piece. Such a beam shaping setup has been successfully tested in the lab several months ago. In the meantime, this method has been further developed and integrated completely in a turn-key system featuring also a fiber laser and a scanner head. The prototype of this turn-key machine is depicted in Figure 1.

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The combination of an LCoS display with a fiber laser and a scanner head makes different laser polymer welding processes within one machine possible. Contour and quasi-simultaneous welding can be achieved with an optimized, i.e. M-shaped intensity profile as well as with a user-defined spot size. Moreover, the laser beam can be shaped to a customer-specific laser contour for one shot welding.

A welded sample representing the high variability of the prototype system is depicted in Figure 2. The sample produced in a single scanner run shows the result of a simultaneous welding (cup on upper left corner) and contour welding with three different spot sizes: 3 mm, 2 mm and 0.5 mm.

For any further questions our experts will be pleased to provide you assistance:

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