Highlight

Kaegiswil,
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Weldseam precision by high resolution mask welding technique

Laser polymer welding requires accuracy in welded seams especially in the medical and automotive technology sector. Very precise and fine welded seams are integral part of microfluidic cartridges and sensor electronics for example. Within the frame of the European project POLYBRIGHT, Leister Technologies AG, Kaegiswil/Switzerland developed a system for high resolution mask welding of polymer interfaces.

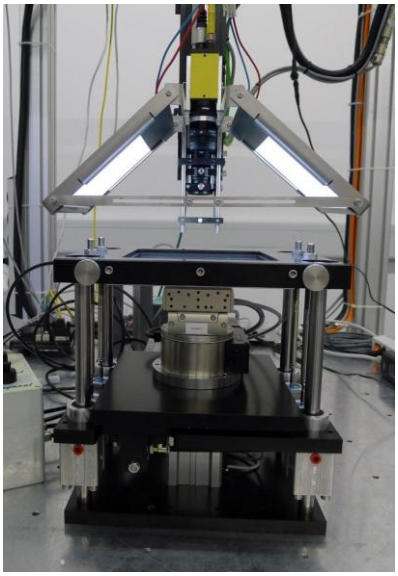

Figure 1: System for high resolution mask welding

Figure 2: Precise polymer welding by laser mask welding technique

During laser mask welding technique, an incident laser line is scanned along a mask, transmitting a weld structure on a work piece. The weld accuracy of this method strongly depends on the optical quality of the incident laser beam, on the pattern precision of the applied mask and on the precision of the mask alignment relative to the polymer parts. The new developed system (Fig. 1) consists of an optical processing head generating a well-collimated and homogeneous laser line and a precise mask alignment system. Moreover, the implemented mask technology is designed for high-power laser application.

The heart of the processing head is represented by a lens featuring an aspherical curvature on its apex. This special lens shapes a Gaussian laser beam to a divergent homogeneous line. A cylindrical lens collimates the laser line in a way that the laser light irradiates perpendicular to the mask. The generated highly collimated and homogeneous laser line allows a one-to-one shadowing of the mask structure on the polymer parts.

A mask depicts the negative reproduction of the desired weld structure. In photolithographic processes, chrome masks are commonly used as photo masks. However, the absorption rate of chrome in the near-infrared range is high and a high-power laser application may result in mask breakdown. Therefore, mask structures precisely ablated by a picosecond laser are embedded in cooper layers for polymer welding.

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Two linear and one rotational axes as well as a camera have been combined to an accurate alignment system. The axes are integrated into a standard clamping device equipped with an additional proximity sensor. By additional support of two diffuse lamps arranged beside the camera, the camera recognizes the position of the polymer part and of the mask simultaneously. A computer calculates the correction and controls the alignment procedure within two seconds. By this means, precise weld seams can be generated (Fig. 2).

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

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