



LASER-BASED PACKAGING OF SILICON-GLASS COMPONENTS BY MEANS OF GLASS SOLDER

Task

When precision components, such as sensors, are manufactured, combinations of inhomogeneous working materials are being used more and more often to produce hermetically sealed packaging. The material pair silicon and glass (borosilicate glass) is frequently used for this. Since the packaging often encompasses temperature-sensitive components, furnace-based processes, such as the anodic or the conventional glass frit bonding, cannot be used, because for this, integrated, temperature-sensitive components would be damaged. Adhesive processes can also be ruled out, since these do not guarantee long-term stable gas tightness to prevent oxygen or moisture from permeating the packaging.

Method

The process of laser beam-based glass frit bonding enables the energy deposition to be minimized since only the energy needed to melt the solder is applied directly to it. A thermal load to sensitive, integrated components can, thus, be avoided. To manufacture the packaging of inhomogeneous working materials, a compatibility of the coefficient of thermal expansion (CTE) is, however, required of the individual components of the overall compound structure.

The actual soldering process takes place nearly simultaneously. With a quasi-simultaneous process the laser beam is guided, by means of a scanner, over the solder contour at speeds of approx. 1,000 mm/s several hundred times, in order to guarantee even bond formation.

Result

Thanks to the quasi-simultaneous process a homogeneous soldered bond between both of the joining parts can be made. To connect a 5.5 x 6.5 mm² glass cover to a corresponding silicon base, a process time of 10 s was reached, with the bond fulfilling the adhesive force requirements.

Applications

Potential applications for this process are the encapsulation of sensors, components of optical or medical-technical products and the packaging of displays.

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