

Microfluidic Devices Benefit from Plastic Welding with Lasers

Challenge

The demand for “lab on a chip” and other disposable microfluidic devices is growing faster than ever, driven in part by mass usage in Covid-19 PCR testing and other high-volume screening applications. These applications require low cost plastic devices that can be produced as molded layers which must then be accurately joined together. Adhesives are not practical for several reasons, leaving plastic welding as the best solution. Ultrasonic welding is low cost but can generate small particles and does not deliver precise and homogeneous “collapse” – the height reduction as the layers are pressed and welded together.

Solution

Joining these microfluidic devices is an ideal application for laser welding and the ExactWeld IP laser machine from Coherent provides an optimum complete solution to produce particle-free lap welds. Several features make this a good match for microfluidic devices, including its high precision supports the current trend for channel size miniaturization.

Another key advantage of the ExactWeld IP is its wide force range. The user can very accurately select any force level between 100 and 4500 Newtons, enabling precise force optimization for every different application thanks also to its rigid support platform. Plus the force is applied in a double closed loop format where a load cell measures the applied force and a linear encoder measures the collapse (typically between 200 and 400 microns) with micron accuracy. So the machine always delivers the target amount of collapse, with high homogeneity, accuracy and consistency.

Coherent is a leader in both laser and scanning technologies and the ExactWeld IP uses fast galvo scanning of a powerful 300 W laser beam at up to 10 m/s, providing quasi-simultaneous welding with multiple passes for excellent weld uniformity.

Benefit

Two layers of many different plastics can be easily joined in this way, including polyethylene, polypropylene, and newer materials such as COC and COP. All that is required is that one plastic is transparent at the laser wavelength and one is opaque. If one of the layers is thin, even two transparent plastics can be joined using the ExactWeld IP. Coherent has multiple application labs around the world supporting detailed process development for new customer applications in plastic welding.

Application Field

Joining microfluidic devices and other plastic medical disposables.

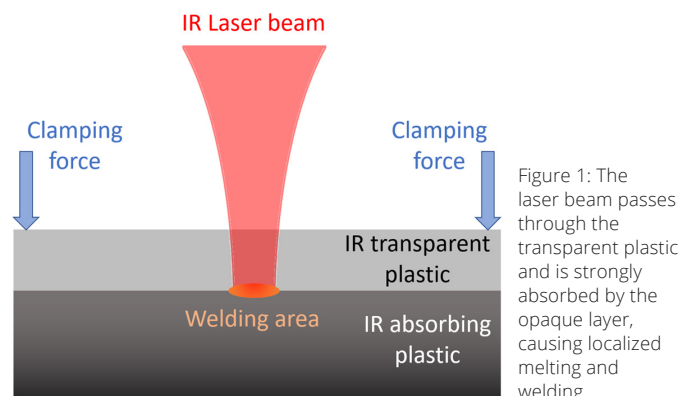


Figure 1: The laser beam passes through the transparent plastic and is strongly absorbed by the opaque layer, causing localized melting and welding.



Figure 2. The ExactWeld IP is a self-contained system with user friendly software controlled through an intuitive GUI.

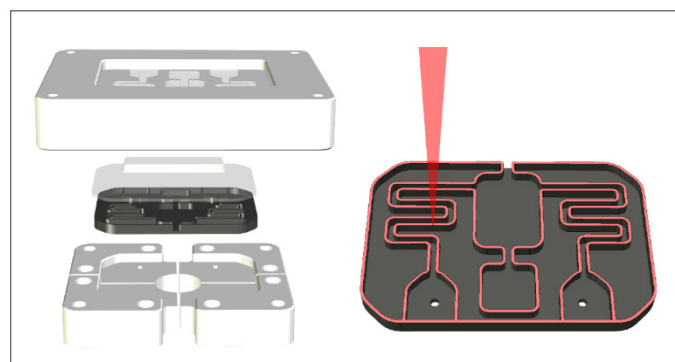


Figure 3. Lab on a chip is a fast growing application for plastic welding.

Contact

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