Laser-Welding Medical Devices

A solid connection: Laser plastic welding with LPKF systems

Contact:
Cordula Krause-Widjaja
cordula.krause-widjaja@lpkf.com
Tel. +49 (0)5131 7095-1327
Fax +49 (0)5131 7095-90

LPKF
Laser & Electronics AG
Osteriede 7
D-30827 Garbsen
www.lpkf.de

Board of Managing Directors:
Dr. Götz M. Bendele (CEO)
Christian Witt (CFO)

Shares:
Prime Standard
ISIN 0006450000

» Other press releases

Plastics are the ideal materials for many devices and their components: they are easy to form, easy to clean, and relatively light in weight. Various technologies are available for joining individual plastic components – from adhesive bonding through ultrasonic welding to laser welding. Laser welding in particular is selected when the joints must satisfy especially high demands for strength and freedom from dust and chemicals.

In laser transmission welding, weld seams with nearly the same strength as that of the parent material are produced. No chips or dust is generated, and the introduction of chemicals is not necessary. So, it's a clean, hygienic process. Weld seam widths in the range of a few hundred micrometers are possible. The weld seams are absolutely tight and the surrounding material remains particle-free. Especially when fine and visually appealing seam structures are required, laser welding is the optimal technology.

In the classic laser transmission welding process, the upper material, which is transparent for the laser wavelength, is combined with a laser-absorbing lower component. The laser beam is focused through the upper joining partner on the absorbing lower joining partner. The lower joining partner melts down to the near-surface region. Through heat conduction, the upper joining partner also melts locally in the region of the weld seam. After cooling, a positive substance joint results – with the same strength as the material itself.

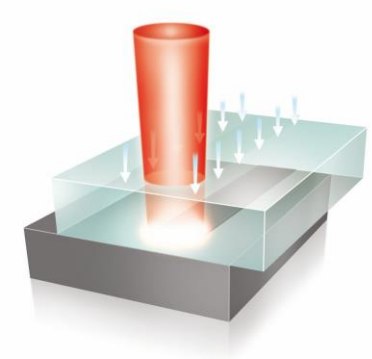

Fig. 1: Schematic of laser transmission welding

The only requirement for a successful joining process is that one of the components must be made of a laser-transparent plastic and the other of a laser-absorbing plastic, whereby there are numerous combination possibilities.

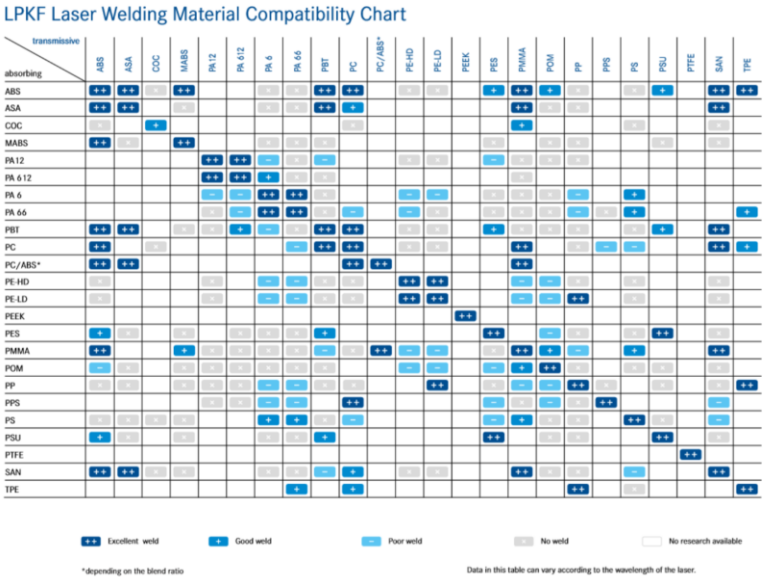

Fig. 2: Materials that can be laser-welded together

This technology finds application in numerous fields of medical engineering: for joining housings for electronic components such as insulin devices or pacemakers. Cylindrical components such as catheters or pins can be laser-welded precisely and reliably, as can cartridges and microfluidics for diagnostic procedures. The individual components of plastic valves that have to withstand high pressures can also be welded excellently and stably with the laser. And the possible geometries are almost limitless.

Apart from the described process variant of transparent-absorbing welding, joining of two transparent joining partners is possible with the so-called clear joining technique through the use of special radiation sources. This is especially of interest when certification provisions for the component do not permit the addition of a laser absorber or the component must be evaluated using optical analysis methods after welding.

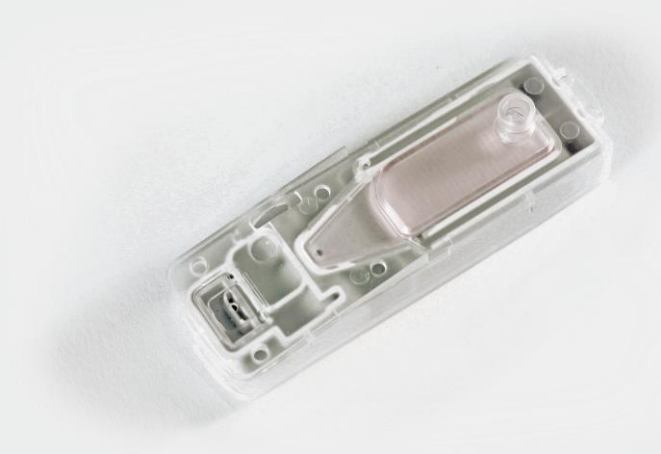

Fig. 3: Microfluidic sensor, laser-welded with an LPKF system

Laser plastic welding machines are available as standalone solutions or for integration into production lines. The market-leading LPKF systems enable traceable and repeatable processes to ensure compliance with specific purity requirements and process validation. With this, they also satisfy the extremely high demands on process and quality reliability in medical engineering.

Depending on the application, different welding methods are used: radial welding, contour welding, or quasi-simultaneous welding. For very exceptional projects, LPKF draws on the experience of its application center. The individual combination of laser, beam guidance, and control makes it possible to accomplish even very complex joining tasks – with automation, if so desired.

Fig. 4: Example of an inline laser welding system: LPKF InlineWeld 6200

About LPKF

LPKF Laser & Electronics AG is a leading provider of laser-based solutions for the technology industry. Laser systems from LPKF are key elements in the manufacturing of printed circuit boards, microchips, automotive parts, solar modules, and many other components. Founded in 1976, the company is headquartered in Garbsen, near Hannover, Germany, and has subsidiaries and representative offices throughout the world. Around 20 percent of the workforce is engaged in research and development.