# Laser welding in medical engineering

**Laser welding of plastics has become an established welding technique in the plastic processing industry. Several of its applications have become ready for series production of the electronics and automotive industry. Now more and more companies from the field of medical engineering have become interested in this clean technique to join plastics parts durable.**

Renowned manufacturers of medical engineering products from Switzerland, Germany, France, the UK and the US are using laser welding systems for different applications. In some industries, these welding systems are used to weld small or medium lot sizes of high end instruments. In other areas, such welding systems are used to weld enormous lot sizes of so-called „disposables“. All these applications use the concept of transmission welding. The materials used for the two joining partners differ considerably in terms of absorption properties. One joining partner is hardly absorbing laser radiation in a specific wave length range. The other joining partner is highly absorbing laser radiation. Prior to welding, the two components are brought into close contact in a clamping device. The radiation required for plasticization penetrates the transparent joining partner. In the other joining partner, however, the laser energy is converted into heat by absorption. The irradiated areas are fused. The fusion process requires that both joining parts are heated. The heat required by the transparent joining part is applied by means of heat conduction from the absorbing joining partner. The resulting weld seam strength equals the strength of the base material.


**Systems like NOVOLAS WS-AT are designed to make the joining process more efficient and economical.**

### Clean process

Some of the characteristics of this welding concept proved especially useful in the medical industry: Because the energy is applied free of contact, the sometimes delicate components are not mechanically stressed. Thermal stress is minimal and restricted to the joining area. Another asset of transmission welding is that it is extremely clean. No particles are created and the product is never contaminated in any form during the process. This means that this joining concept is absolutely suitable for clean room conditions.

Some customers require very clean conditions to join systems for drug dosage. One example for this is the Rowe-Pump, a physically powered, patent pending infusion pump, developed and manufactured by the medical technology specialist Rowemed in Parchim/Germany. It is used for critical drug administration and is the first injection pump worldwide featuring a device to control constancy of flow rate without use of additional electrical equipment. It combines performance, safety, comfort and patient flexibility and may be used for both intravenous and subcutaneous injection. The components need to withstand internal pressure of up to 4 bar. The pump is used in direct contact with the patient and needs to meet high

**On the infusion pump Rowe-Pump the micro-channels are located in immediate proximity to the weld seam. Therefore energy input needs to be extremely precise.**

standards of hygiene. Furthermore, the integrated micro-channels feature diameters in the area of > 10µm. The welding environment therefore needs to be dust-free and protected from contamination. Since the micro-channels are located in immediate proximity to the weld seam, energy input needs to be extremely precise. During the evaluation process it has soon become evident that laser transmission welding is a suitable procedure meeting the requirements listed above.

**Semiautomatc machine for series production**

A further application for laser welding of plastics is in production at the Swiss hearing aid specialist Phonak. In the novel «SmartGuard» cerumen protection concept for the small ITE (in the ear) hearing aids a highly elastic, extremely thin diaphragm is welded onto a small carrier ring. The method of mask welding is used. Batch processing processes, which are carried out semi-automatically and which can be run on plants such as the NOVOLAS WS allow volumes of several millions to be produced in a year. Not least is the advantage that the joining process is even more economical because of the lack of additional material consumption. Further products welded by this technique are filters and filter housings, endoscopy accessories, micro well plates, fluidics containers used in analytics as well as locking caps in various designs and sizes.

Laser transmission welding has become a well-established joining technique in medical engineering. It is especially attractive for this industry not only because it is an extremely clean process which is suitable for clean rooms.

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