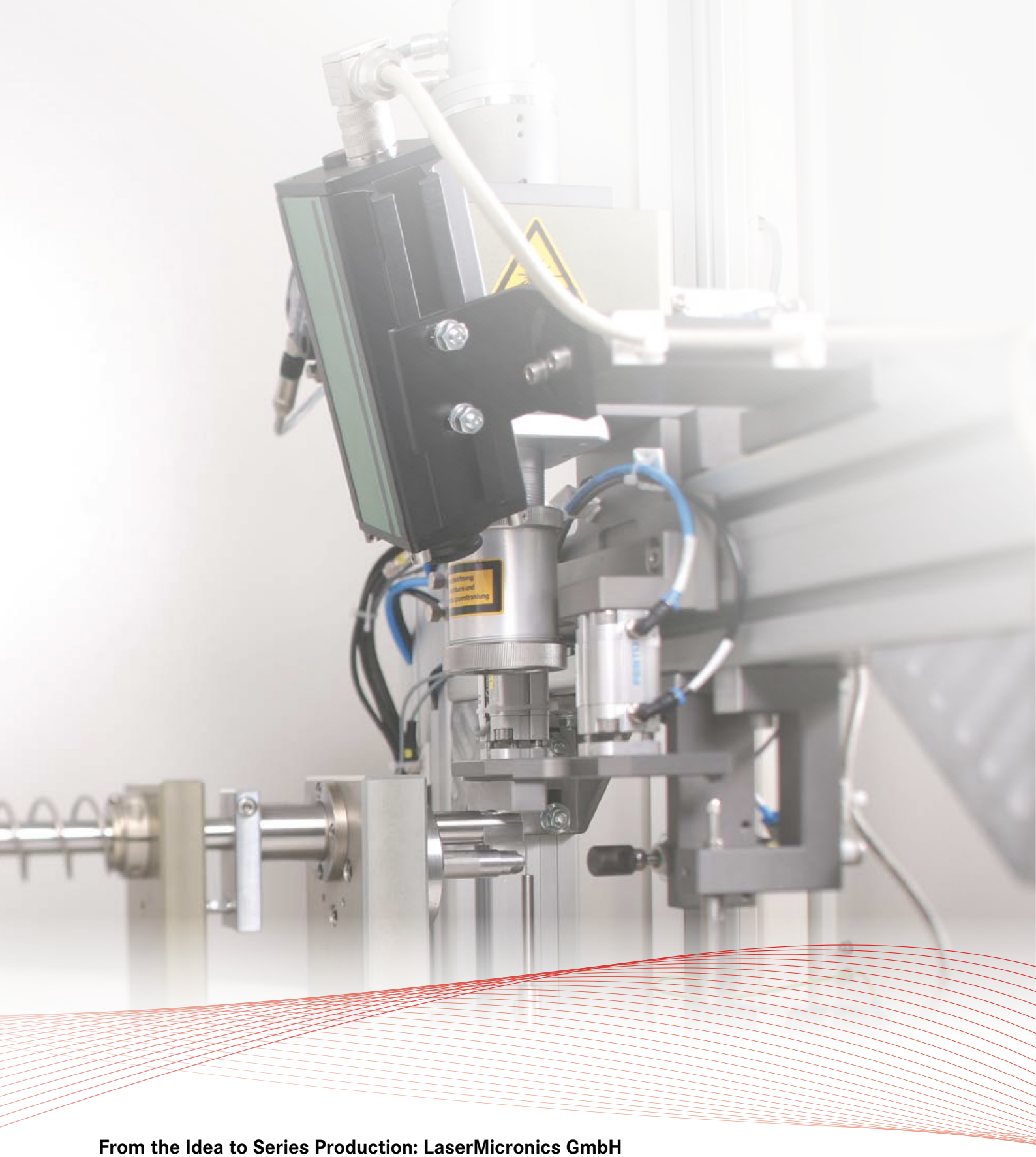
Laser Plastic Welding

Clean, Safe and Stress-Free

LaserMicronics

MICROMACHINING SERVICES



From the Idea to Series Production: LaserMicronics GmbH

LaserMicronics GmbH offers services in the industrial laser micro-machining and process development. As a subsidiary of LPKF Laser & Electronics AG, the application engineers of LaserMicronics have access to the world's most advanced laser-based production systems.

The bandwidth of services covers feasibility studies, process optimization, the production of prototypes up to small series and series production. The wide spectrum includes, for example, laser plastic welding, MID-technology, laser cutting, drilling and structuring of PCB material, TCO / ITO laser processing, fuel cell technology or laser-cut micro-parts.

Binding Solutions

Lasers are becoming increasingly popular for joining two components together because the technique is fast, reliable and inexpensive. As a leading service provider, LaserMicronics uses high-end laser systems from LPKF Laser & Electronics AG with various laser sources.

Transparent and Absorbent Thermoplastics

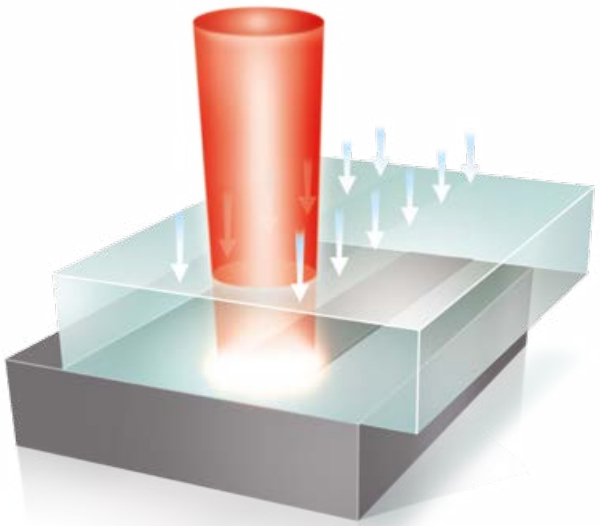
Laser welding relies on two types of polymers, transparent or absorbent. Most thermoplastics in their natural state are transparent at typical laser wavelengths. Additives, such as carbon, in the plastic change the properties so that they become absorbent. The absorbing surface converts the laser energy into heat.

In the transmission laser welding technique, a material transparent to the laser wavelength lies on top of an absorbent material. A clamping tool presses together the parts to be joined. The laser beam penetrates through the transparent component with minor energy loss and melts the surface of the absorbing material. Heat transfers through conduction to plasticize the adjacent surface of the transparent material.

This process is precisely controlled and continuously monitored during laser welding to ensure a repeatable quality weld. After resolidification, the two parts at the joint have been reliably and cohesively bonded.

Reliable Clamping Technology

A defined pressure joins the materials together during the laser welding process. It is therefore essential that the technology works with complete reliabilty. Uniform clamping is vital for high process quality. Pressing the parts together is crucial for effective thermal transfer.



From Ideas to Products

Narrow laser beams for a glowing future. Modern laser plastic welding boasts numerous benefits and goes well beyond the limits of traditional joining methods. Thanks to its specific advantages, it opens up completely new applications and markets.

New Applications and Material Combinations

High joint quality criteria bring the economic advantages of laser plastic welding into the spotlight. No other method simultaneously combines such a high degree of safety, cleanliness and speed – opening up completely new opportunities!

Laser plastic welding can easily handle complex three-dimensional designs. The beam head itself never touches the material. Even poorly accessible zones or thick layers can be safely joined. Other convincing features are the continuous development of new materials and a wide range of combination options. The process is so gentle, the LPKF-Systems are ideal for components with sensitive surfaces.

Automotive, medical and consumer products all profit from the laser plastic welding technique.

Economic Advantages:

- Fast product development
- High flexibility
- Short cycle times
- Simple product solutions

Comparison with Alternative Methods

Laser Compared to Ultrasonic and Vibration Welding
- Minor mechanical impact on the components
- No surface damage
- Completely particle-free
- Highest visual quality joint line
- No tool wear and tear, minor tool costs

Laser Compared to Mirror and Hot-Gas Welding
- Minor thermal stressing of components
- Lower melt overflow
- Much shorter cycle times
- Lower machine and tool costs

Laser Compared to Hot-Melt Technology and Gluing
- No additives required
- Better options for online process monitoring
- Highest visual quality joint line
- Higher quality and long-term stability
- Shorter cycle times

Assured Quality

Laser plastic welding is designed to satisfy the highest quality standards in production. It begins with a reliable welding process and continues into the testing phase. LaserMicronics uses LPKF-Systems with integrated process monitoring. They include regulation mechanisms which correct even the smallest deviations. The successfully tried-and-true pyrometer measures the temperature in the joining zone to provide information on localized interferences. This range of monitoring systems provides the optimal basis for ISO quality monitoring and documentation.

Almost all scanner-based LPKF-laser-systems are equipped with this monitoring method by default.

Other methods like pyrometers or burn detection round off the process monitoring package.

Optimal Technique – Optimal Result

Different approaches of laser plastic welding can be used. Each method has its own specific strengths. LaserMicronics development engineers help to identify the best welding method for each application.

Advantages of Laser Plastic Welding

- Optional online process monitoring
- Visually high quality weld seam
- Particle-free welding
- Minor stress on the components
- No surface damage

Contour Welding

Contour welding is particularly good when rotation-symmetrical or very large components need to be welded without any melt overflow.

Simultaneous Welding

Simultaneous welding is especially recommended for extremely high production runs which justify the large investment required for the special laser equipment.

Quasi-Simultaneous Welding

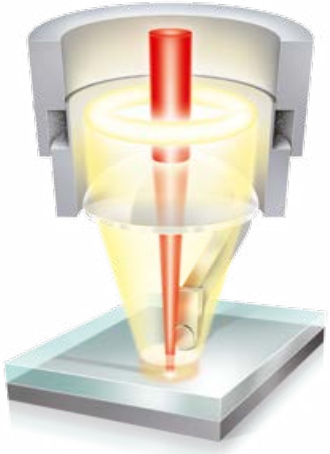
Quasi-simultaneous welding is a combination of contour and simultaneous welding. Quasi-simultaneous welding enables the melt travel to be monitored and compensates for tolerances in the molded parts.

Patented Laser Hot Riveting

Laser hot riveting combines riveting technology with laser plastic welding. This method provides a clean process. Laser hot riveting can be used to join components which cannot be welded directly.

Patented Hybrid Welding

Hybrid welding combines laser energy with infrared thermal radiation. The laser process occurs in a heating field, which minimizes operation times and avoids stress of the components. The main application for this technology is structural components in the automotive sector, such as: automotive lighting and motor assemblies.



- Shortest cycle times
- Stress-free energy input
- Particle-free processing
- High flexibility

Automotive and Medical Technology

When welding seams in the micrometer range are required, laser plastic welding is the first choice. For car makers, the automotive subcontracting sector and for medical applications Laser welding is one of the disciplines which meet the demand of low-cost/high quality requests.

Car makers and manufacturers of medical products benefit from the outstanding features of Laser plastic welding. Modern cars are equipped with numerous sensors to boost passenger comfort and safety. The advantages of laser processing stand out when sensitive electronic assemblies are used in these sensors. Instead of screwing, gluing or pouring sensor housings, they are joined by lasers gently, reliably and economically. Additionally, the entire welding process can be documented for later inspection. Practical examples of using laser plastic welding are control devices for electronic steering systems and control calves for lumbar support systems.

ABS control-unit

Valve parts

Over-pressure/under-pressure unit for car fuel tanks

Fully-integrated transmission control

Microfluidic sensor

PTCA catheter

Micro-atomizer

Cell culture flask

Laser plastic welding scores on particle-free processing, different validation methods even during the welding, and obligatory clean-room compatibility. A laser-welded microfluidic cartridge opens up a whole new range of opportunities for surgeries and clinics lacking sophisticated laboratory facilities. LPKF was selected to make this product because of the specified two-meter-long joint line, particle-free and additive-free contact surfaces, hermetic seal, and guaranteed channel cross-sections.

LaserMicronics – Your Service Partner

At its offices in Garbsen (near Hanover) and Fürth in Bavaria, LaserMicronics GmbH provides development and production services in the areas of laser micro-material processing and laser beam plastic welding. Apart from its comprehensive production service, LaserMicronics also consults on process development and optimization.

Other Products and Services by LaserMicronics

Challenging Cutting Applications

The laser systems used can process classic circuit board materials (circuit board repairs), but also invisible ITO layers, LTCC, or fired ceramics and micro cut parts made of metal.

Request a brochure:

info@lasermicronics.de

Just Call us for More Information about:

- Selective plastic activation and metallization using LPKF-LDS technology
- Laser subtractive structuring (LSS) and metallization
- Laser plastic welding
- Solar technology
- TCO/ITO layer structuring
- Micro-drilling
- Structuring
- Ablating metallic and organic layers
- Cutting
- Scribing
- Marking
- Engraving
- Laser machining of ultra precision metal parts

LaserMicronics GmbH

Garbsen office: Osteriede 9a 30827 Garbsen Phone +49 (0) 5131 90 811-0

Fürth office: Alfred-Nobel-Str. 55 - 57 90765 Fürth Phone +49 (0) 911 9764 589-0

info@lasermicronics.de www.lasermicronics.com

DeuZert Deutsche Zertifizierung
DIN EN ISO 9001:2008

Pictures may show optional equipment.

LaserMicronics GmbH, 10005661-211016-EN