

High Volume Production
with Multiple Laser Heads
LPKF Fusion3D





Designed for High Volume

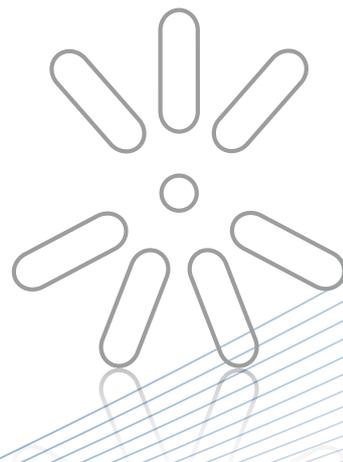
Modern 3D components are ultra-compact and complex in function. They combine mechanical and electrical functions, reduce weight and assembly times and have no problem squeezing into tight spaces. The Laser Direct Structuring method (LPKF-LDS®) has enormous innovation potential. The LPKF Fusion3D laser system is highly economical, taking full advantage of the LDS production method.

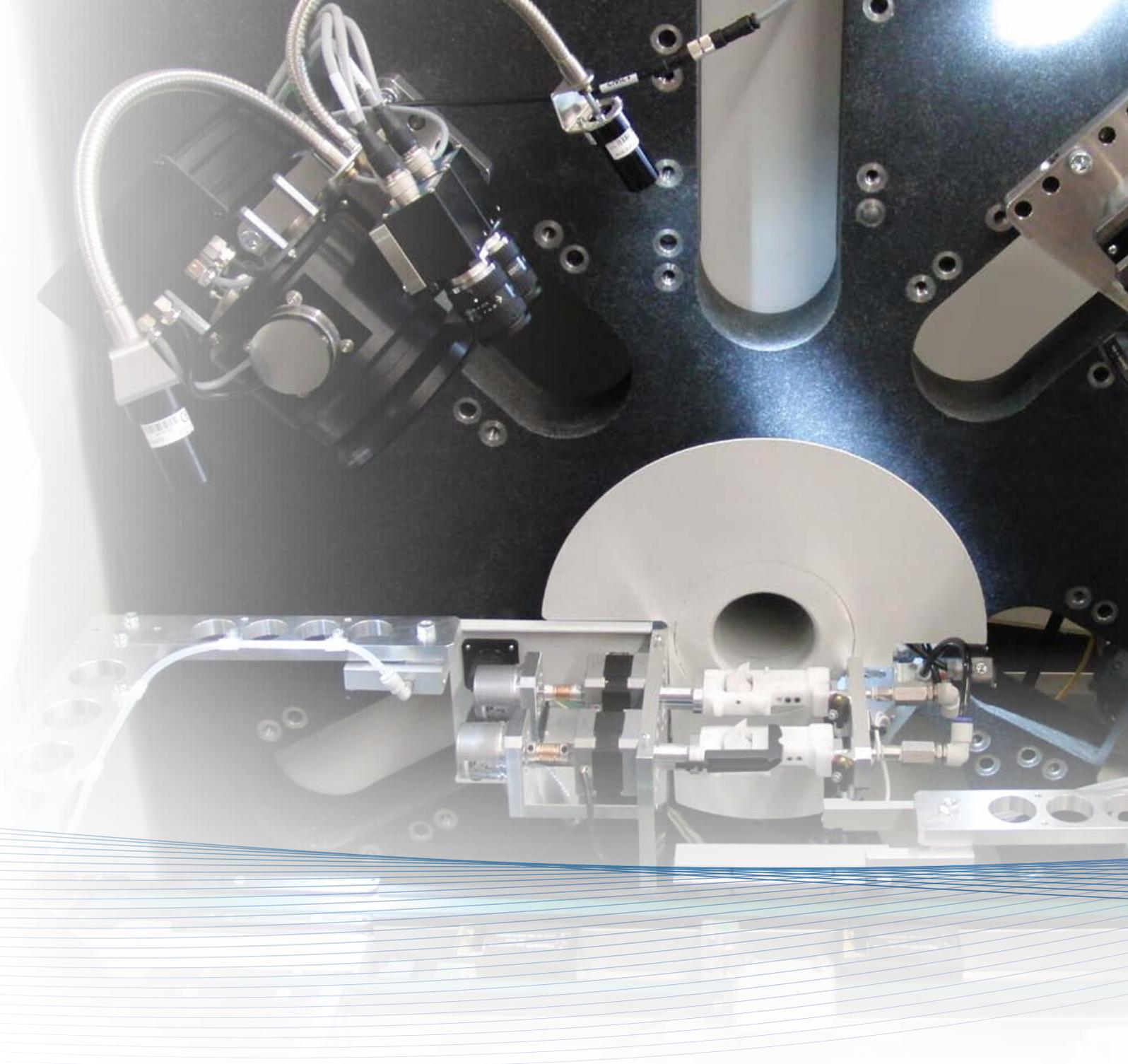
New Design Options, New Products

Smaller, lighter, more functions, better performance. These are just some of the benefits electronic designers are gaining when they choose to use molded interconnect devices (MIDs). They access new dimensions for optimized production processes and new products which would be impossible without the innovative LPKF-LDS® technology. Three-dimensionality stands for the enhanced use of the available space, for less complex assembly, and for higher functional density. The LPKF Fusion3D provides a level of productivity that is unmatched, making the production of MIDs very economical.

Boosting Efficiency

Using innovative concepts is one side of a technical development – making them profitable in production is the other. The LDS method does both, and the latest generation LPKF Fusion3D laser system increases the economic advantages even more. Complex three-dimensional components have to be structured from multiple sides – in the LPKF Fusion3D this happens simultaneously with as many as four laser heads. This reduces the time needed for laser structuring and it also eliminates the time otherwise needed for rotating the components. The LPKF Fusion3D makes production runs with high quantities economical for all kinds of applications.





Seven at a Time!

High Throughput

Efficiency was the most important goal driving the development of the successful MID laser structuring system. The LPKF Fusion3D is the most advanced system for laser-structuring molded interconnect devices. The solid granite structure holds up to 4 laser heads that are positioned around the part to be structured. This completely waives the need for any rotation of the component.

Simplified Handling

Setup and changeover to a different part is done quickly. The production data is stored with all parameters, for easy access at any time. The machine software automatically distributes the processing data to each individual head, optimizing the cycle time. The robotic parts handling ensures speed, accuracy and repeatability while keeping personnel cost to a minimum.



- Up to four laser-heads in seven positions
- Highest productivity
- Designed for 24/7 production
- Includes high performance machine software



Reliable efficiency
Engineered for safety
User-friendly
Eco-friendly

Greater Precision

The absolute accuracy is the sum of all tolerances. Avoiding movements during structuring, and mounting structuring mechanism to solid granite, guarantees even higher precision.

Designed for 24/7 operation, the LPKF Fusion3D is fully equipped down to the last detail for the production of high quality components.

Consistent Quality

A sophisticated vision system identifies the position of the component and scales the circuit artwork to the nearest micrometer – effectively compensating for tolerances associated with injection molding.

Flexibility Wins

Since the LPKF Fusion3D is a software-based production system, tuning the pattern only means changing the artwork file. The system is also very flexible: the modular design simplifies production and service – with rapid implementation of laser sources and low setup cost. Plug & play components are keeping service cost and downtime to a minimum.

Sophisticated Technology for Future Markets

Hundreds of application examples in mini and medium series provide valuable experience for ramping up innovative technology ready for industrial mass production.

MID components have many benefits as an alternative to conventional electronic parts assembled from many components. And when the third dimension is already taken into consideration during the design phase, there is an exponential jump in the advantages with regard to integration and miniaturization.

Costs-per-unit plummet by saving a few printed circuit boards here and a few assembly steps there – at an industrial scale, the sum of several small economies equates to major financial savings. 3D-MID components combine mechanical and electronic functions in an easily manufactured component.

Examples of Innovative Solutions:



Mobile telephones are becoming smaller and more powerful. LDS antennas increasingly handle communications in a whole range of frequency bands.



A pressure sensor can be produced directly on the inside of the housing in one processing step.



A premium segment carmaker equips its steering wheels with MID technology switches.

The LPKF-LDS® Process at a Glance

Four steps from polymer granulate to molded interconnect device.

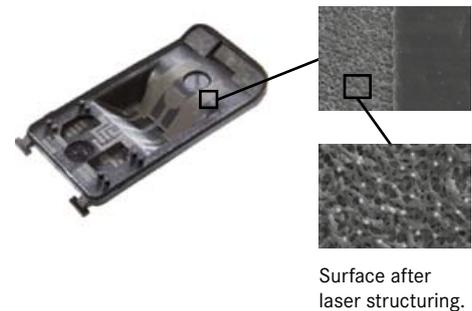
1. Injection Molding

The parts to be laser structured are produced using 1-shot injection molding of commercially available doped thermoplastic. Compared to 2-shot molding only a simple tool is needed and the molding process is faster.



2. Laser Activation

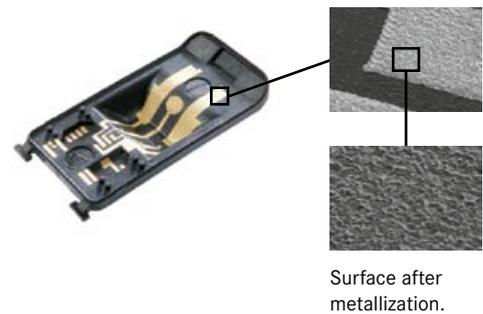
The laser-activatable thermoplastic is doped with a special additive. It is activated by the laser beam, where a physical-chemical reaction forms metallic nuclei. These act as a catalyst for reductive copper plating. In addition to activation, the laser creates a microscopically rough surface in which the copper is firmly anchored during metallization.



3. Metallization

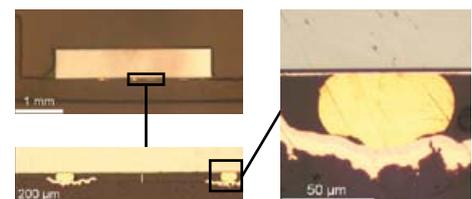
Metallization of the LPKF-LDS® parts starts with a cleaning step. Then follows an additive build-up of the tracks typically 5 – 8 µm with the help of electroless copper baths. Lastly follows plating with currentless nickel and flash gold, if required.

Application-specific coatings such as Sn, Ag, Pd/Au, OSP etc. can also be created.



4. Assembling

A number of laser-activatable plastics with high degrees of thermal stability, such as LCP, PA 6/6T or PBT/PET blend are reflow solderable and therefore compatible with standard SMT processes. Dispensing is commonly the process for applying solder paste on different heights of assembling levels. Reliable technical solutions for 3D assembly operations are available today.



Stud bonding on an electroless plated pad with Cu/Ni/Au.

Worldwide Support

LPKF-LDS® users enjoy optimal support from our service centers in Europe, the USA and Asia. Experts in the Application Center in Germany provide advice on process rollout, and use their many years of practical experience to assist with sample production.

| Technical Data: LPKF Fusion3D | |
|---------------------------------------|---|
| Structuring area | 130 mm x 130 mm x 50 mm (5.1" x 5.1" x 2.0") |
| Number of nests | 1 to 2 |
| Positioning accuracy | ± 35 µm (± 1 mil) |
| Max. structuring speed | 6,000 mm/s (197 ft. per second) |
| Input data formats | 3D-DXF, IGES, STEP |
| Laser wavelength | 1,064 nm |
| Laser pulse frequency | 10 kHz – 200 kHz |
| Machine dimensions (W x H x D) | without Handling: 3,100 mm x 1,830 mm x 800 mm (122" x 63" x 32") with Handling: 4,400 mm x 1,830 mm x 2,000 mm (170" x 63" x 79") |
| Machine weight | approx. 2,000 kg (4,400 lb.) |
| Optional part handling | |
| Robots | 2 |
| Belt conveyer | 2 |
| Tray dimensions (W x H x D) | 80 mm x 27 mm x 80 mm (3.15" x 1.06" x 3.15") |
| Operating conditions | |
| Electric supply | 3 x 400 V + N + PE, 50/60 Hz, ~ 15 kVA |
| Cooling | air-cooled |
| Ambient temperature | 22.5° ± 2.5° |
| Humidity | max. 60 % |
| Exhaust | |
| Volume flow | up to 600 m³/h, max. suction 21,000 PA |
| Filter | Active charcoal filter and F8 fine filter |

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