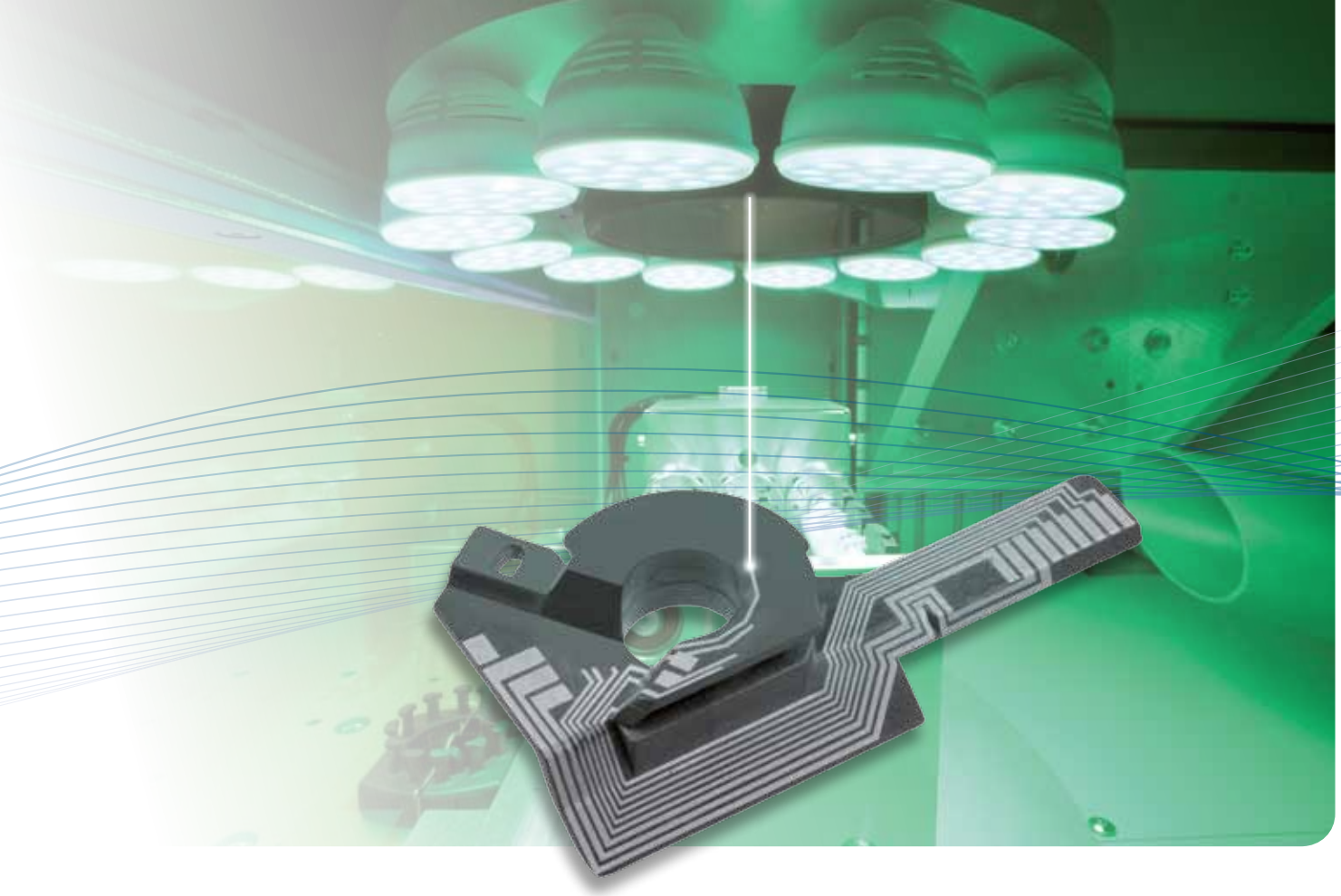
Laser Direct Structuring of 3D Circuit Carriers

LPKF MicroLine 3D

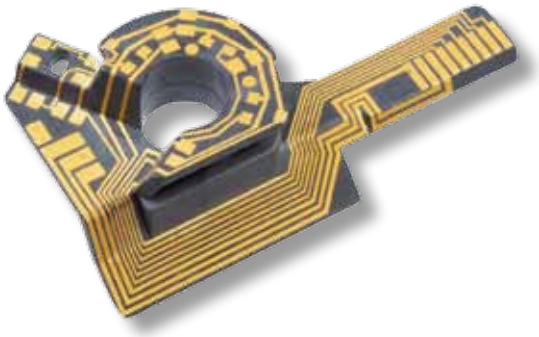
LPKF
Laser & Electronics



MID production using the LPKF-LDS method (Laser Direct Structuring)

The LPKF-LDS method for MID production (Moulded Interconnect Devices) creates ultrafine lines on any type of three dimensional shape. The method involves 4 basic steps. Laser Direct Structuring takes place immediately after single component injection moulding of the carrier: a laser beam takes only a few seconds to structure the artwork directly from the computer onto the plastic component – without tools or masks.

This creates a micro-rough surface. The lines are formed on this activated surface structure in currentless chemical baths. After subsequent assembly, the component combines mechanical and electronic functions in a very compact space.



Mechatronic component, structured and metallized
(Source: Iskra Automobiltechnik)

Processing steps in the LPKF-LDS method:
1-shot injection moulding, laser structuring, metallization, assembly

Fast structuring for fast-to-market

The patented Laser Direct Structuring method (LPKF-LDS) is ideal for transferring circuit artwork onto three dimensional plastic components. The perfect tool for this application is the LPKF MicroLine 3D laser system. It is extremely fast and flexible. The special ability of this laser to create very fine structures opens up new market opportunities for mechatronic component manufacturers.

Flexibility wins

The LPKF MicroLine 3D was specially developed for the laser structuring of moulded interconnect devices (MID). The laser writes the circuit-layout onto the plastic components. Then these structures get metallized – and become conductive. The toolless machining with the LPKF MicroLine 3D is ideal for a diverse product mix. It boasts the flexibility to accommodate customer demands and satisfy production planning because different designs can be very quickly set up and produced efficiently. The LPKF MicroLine 3D is set up for manual loading and unloading routines as well as a production machine for automatic handling.

Sophisticated laser technology

LPKF Laser & Electronics AG bundles core competencies in laser technology and laser-based material processing. The sophistication of its machines is built on over 30 years experience in manufacturing prototyping and production systems for industrial applications. The manufacturers of innovative PCBs profit every day from the high quality of its products and services.

Global support

LPKF-LDS users have service centers close by in Europe, the USA and Asia. Experts in the application center in Germany use their expertise to provide practical and knowledgeable advice when the LDS method is used for the first time, including the production of samples.

LPKF MicroLine 3D

true 3D TECHNOLOGY

LPKF

Reliable efficiency
Engineered for safety
User-friendly
Eco-friendly

- Real 3D processing
- Short set-up times
- High throughput

Simple handling
The LPKF MicroLine 3D can be quickly set up and converted. All production data parameters can be saved and easily accessed for future use.

Real 3D capability
The synchronised control of the deflection unit and the special optics guides the laser beam over the real topography of the component. In combination with the component handling the artwork is quickly and directly transferred onto any shape of the free-forming surface.

Integration in Manufacturing Execution Systems (MES)
The LPKF MicroLine 3D creates interfaces for integration in an overall MES infrastructure. This supports the collection of operational data, machine assignment, Tracking & Tracing, as well as product-routing.

High machine capability
Designed for 24/7 operation, the LPKF MicroLine 3D is equipped with top quality components. The system boasts excellent laser structuring repeatability. Another important factor in maintaining constant high processing quality is the optional measurement of the laser power at substrate level.

Minimal secondary processing time
Special component mountings can hold several components at the same time. The intelligent process control, combined with the dynamic rotary axes, place the components in the optimal positions for 360 degree laser processing. Up to three rotary units can operate simultaneously. Loading and unloading in parallel to the laser structuring takes place via the high speed rotary table.

Constant component quality
A sophisticated vision system identifies the position of the components and scales the artwork to the nearest micrometer. This compensates for tolerances arising from the injection moulding. 100% quality control can be set up in line with specific criteria, and completely integrated. Data for good/bad parts detection are transferred via the Profibus interface.

User-friendly software
The standard software converts all conventional artwork formats such as STEP and IGES into production ready data in easy steps. The system supports several user levels with their own access authorisations, for optimal adjustment to individual production needs.

Low maintenance requirements and safe handling
The long life, energy-saving laser source in the system operates for thousands of hours without any readjustment or replacement of spare parts. The LPKF MicroLine 3D is classified as a Class 1 laser system when in operation.

Technical Data: LPKF MicroLine 3D

Structuring area	160 mm x 160 mm x 24 mm (6.3” x 6.3” x 1.0”)
Positioning accuracy	±25 µm * (±1 mil *)
Max. structuring speed	4,000 mm/s (13.1 ft. per second)
Input data formats	HPGL, DXF, 3D-DXF, IGES, STEP
Laser wavelength	1,064 nm
Laser pulse frequency	20 kHz – 200 kHz
Machine dimensions (L/W/H)	1,950 mm x 1,050 mm x 1,600 mm (77” x 41” x 63”)
Machine weight	approx. 750 kg (1,650 lb.)
Rotary table	
Diameter	500 mm (19.5”)
Number of nest holders	2
Max. dimensions of nests	200 mm x 200 mm (7.9” x 7.9”)
Cycle time	<1 s
Operating conditions	
Electric supply	3 x 400 V + N + PE, 50/60 Hz, 2,5 kVA
Cooling	air-cooled
Ambient temperature	22.5 °C ± 2.5 °C (72.5 °F ± 36.5 °F)
Exhaust	
Volume flow	320 m^3/h, max. suction 21,000 PA
Filter	Active charcoal filter and F8 fine filter

* with drift compension and vision system

During normal operations, the system is classed as a Class 1 laser product.
In service mode, it is a Class 4 product.

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