Cost-Effective Entry into Laser Direct Structuring (LDS)

LPKF Fusion3D 1100

LPKF
Laser & Electronics

A simple plastic clip integrates conductive paths and becomes a smartphone antenna: the LPKF LDS process leads to new product designs and introduces new and efficient forms of production - from a single component to mass production.

Introducing New Manufacturing Methods for 3D Circuitry

Smaller, more complex, more compact. Modern electronics present manufacturers with great challenges. MID components offer an effective way to overcome these challenges, turning simple plastic components into high-quality 3D interconnect devices. The LPKF Fusion3D 1100 provides cost-effective access to this technology, and is ideal for small batches or 3D prototyping.

In today's electronics, an increasing number of functions must be accomplished in a constantly dwindling space. As a result, components like plastic clips, panels and housing parts, which previously served a purely mechanical purpose, are now taking on electronic functions. Injection moldings are the basis for these three-dimensional interconnect devices, also known as molded interconnect devices (MIDs).

Laser direct structuring (LDS) has attained a market share of more than 50 percent among production methods. Just about every second smartphone has an LDS component. Other markets are experiencing rapid growth including the automotive industry, medical technology and the consumer field.

The LPKF Fusion3D 1100 provides a cost-effective and flexible entry into this rapidly growing technology.

The LDS Process
Components are produced from plastic with additives in a single injection molding process for laser direct structuring. Every major supplier offers LDS plastics. A newly developed LDS-graded lacquer, LPKF ProtoPaint LDS, provides the same properties for laser structuring.

The laser structures the surface and roughens it, activating the additive. Rotating the component and tracking the laser focus during the machining process adds true three-dimensionality.

First copper is deposited on the activated structures in an electroless plating process. If necessary, nickel and gold are deposited in additional baths.

Cost-Effective, Entry-Level LDS Technology

Laser direct structuring has been tried and tested in a broad range of products. LPKF is contributing to this innovative technology's continued growth with a new entry-level system, the LPKF Fusion3D 1100.

The LPKF Fusion3D 1100 lowers the price threshold for entering the 3D interconnect device market. It can be used for manufacturing small volumes or for prototyping without removing high-volume systems from production.

- Flexible, compact, lab-fit
- Proven Fusion3D platform
- For prototypes and small batches

Built-In Flexibility

The LPKF Fusion3D 1100 features a solid granite base and casters that allow it to be easily moved around. This design combines efficient components with a compact design suitable for lab use. The LPKF Fusion3D 1100 features a large, height-adjustable work surface onto which the customer's fixtures can be mounted. A pilot laser helps to align the structuring data.

Proven Technology

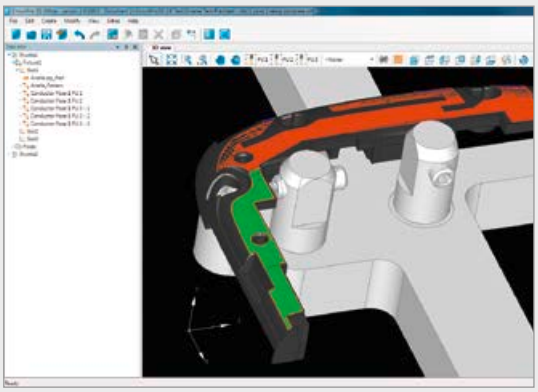
The LPKF Fusion3D 1100 uses the same laser processing unit as all other Fusion3D systems. The CAM software, production parameters and structuring area are identical and the parameters determined on the Fusion3D 1100 can be copied directly to the mass production system.

Fusion3D 1100 for 3D Prototyping

The large work surface with z-axis travel is excellent for prototyping, and can also be used to produce small batches. The Fusion3D 1100 can be equipped with customer jigs or actuators for handling the pieces to be laser processed.

Grows with your Applications

The Fusion3D 1100 comes with an I/O interface as standard. This allows to automate the part handling – for example by using a turning unit. The Fusion3D 1100 can be converted to a Fusion3D 1000 for highly sophisticated automation requirements and mass production.



Converting Data with Ease

CAD data is used as a basis for the laser structuring of 3D MID parts. Volume models from 3D layout programs include the component information and surfaces to be structured.

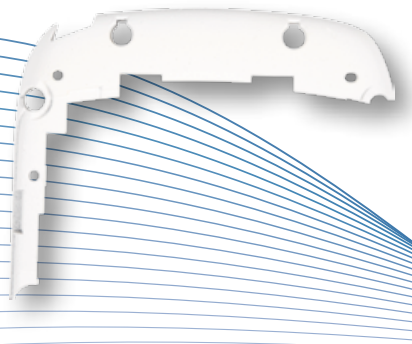
The data acquisition and processing of structuring jobs is carried out by LPKF CircuitPro 3D software, which interprets the data and optimizes the structuring process. Complex layouts can be split into individual poses to allow laser-structuring in different positions.

Near-Series Prototyping

Several stages are required between the design of an MID component and the start of the mass production: decision making, prototyping, assembly studies or general acceleration of product development. It's important to create prototypes as close to series as possible, an often time-consuming and costly process. The LPKF Fusion3D 1100 and associated prototyping methods allow functional prototypes to be built in one day, without blocking production systems.

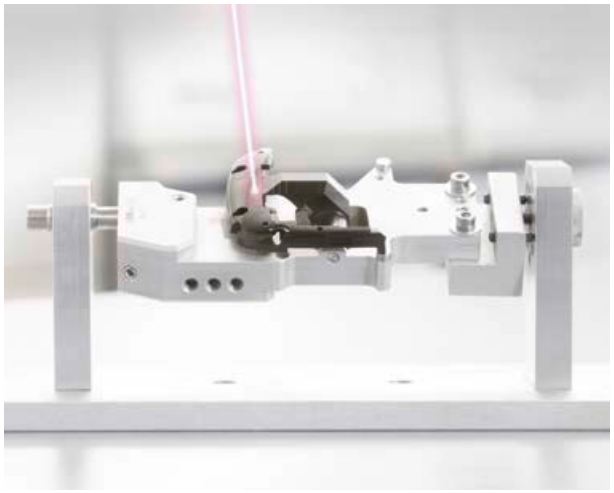
Constructing the Base
Rapid advances in 3D printing methods allow components to be manufactured directly from CAD data – without molds. Stereolithography, laser sintering or FDM (Fused Deposition Molding) are used layer by layer to build the blank from the design data.

Applying an LDS Lacquer
LPKF has developed a paint with LDS additives which can be laser activated. After applying and curing the paint, the component can be processed just like any conventional LDS component.

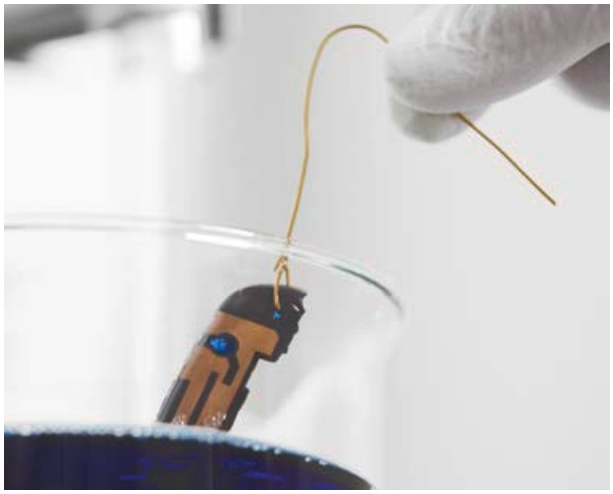


LPKF ProtoPaint LDS Makes Plastic Parts LDS-Capable
The LPKF ProtoPaint LDS makes many plastic surfaces LDS-capable. The dual-component paint consists of a basecoat and a hardening agent. LPKF ProtoPaint LDS accelerates the prototyping of mechatronic components with generative 3D manufacturing processes. The material blank is provided at a layer thickness of approx. 20 – 30 µm. Partial paintings are also possible – especially on larger objects.

LPKF ProtoPlate: Metallization for Prototypes
Mix, throw it in, wait. The new trend-setting metallization technology allows just one bath in the beaker and does not require any large laboratory devices. The metallization bath is specifically designed for the LDS process. It produces a simple and reliable copper coating of activated plastic surfaces. The single-component bath can be purchased via LPKF and is especially suitable for making inexpensive close-to-production prototypes.



Laser Structuring with the LPKF Fusion3D 1100
The laser structurer transfers the proposed conducting paths to the coated component in a matter of seconds. A pilot laser helps align the data when various positions are required.



Metallizing the Component
Electroless plating is the last step in the process. LPKF provides a solution for prototyping which can also be used for manufacturing small volumes or determining the optimal laser parameters under standard metallization conditions. A copper layer only requires one metallization step in a beaker, but even the subsequent processes for nickel and gold are clearly defined.

Additional Applications for LPKF Fusion3D Systems

The LDS process is also ideal for other materials and applications that profit from the non-contact laser process, such as the ablation of gold layers from ceramics. The Fusion3D systems are also able to engrave metal surfaces, cut flexible PCB foils, and trim ceramic resistors.

Laser Direct Structuring with Global Support

LPKF Fusion3D laser system users around the world benefit from application centers in Germany, the USA, Japan, Korea and China. These centers give customers access to LPKF's years of experience in laser material processing and the full range of LDS technology. Please contact LPKF for application reports and more information.

Technical Data: LPKF Fusion3D 1100	
Laser class	1
Structuring area (X x Y x Z)	160 mm x 160 mm x 80 mm (6.3" x 6.3" x 3.2")
Number of processing units (PU)	1 – 3
Fixturing base plate	413 mm x 730 mm (16" x 28")
Accuracy*	± 25 µm (± 1 mil)
Max. structuring speed	4 000 mm/s (157" per second)
Input data formats	IGES, STEP
Software	LPKF CircuitPro3D
Laser wavelength	1 064 nm
Laser pulse frequency	10 kHz – 200 kHz
Machine dimensions (W x H x D)	921 mm x 1 880 mm x 1 441 mm (36'' x 74'' x 57'')
Machine weight	Approx. 550 kg (1 200 lbs), excluding exhaust unit
Operating conditions	
Electric supply	230 V single phase, 50/60 Hz, ~1.5 kVA
Cooling	Air-cooled
Ambient temperature	22° C ± 2.5° C (71.6° F ± 4° F)
Humidity	Max. 70 %
Exhaust unit	Required; available as an option
Machinable materials (selection)	Nickel, copper, stainless steel, LDS plastics, powder coatings and LDS paint, gold and silver paste, ceramic, tin

* Calibrated scanfield

Worldwide (LPKF Headquarters)
LPKF Laser & Electronics AG Osteriede 7 30827 Garbsen Germany
Phone +49 (5131) 7095-0 info@lpkf.com www.lpkf.com

North / Central America
LPKF Laser & Electronics North America
Phone +1 (503) 454-4200 sales@lpkfusa.com www.lpkfusa.com

China
LPKF Tianjin Co., Ltd.
Phone +86 (22) 2378-5318 sales@lpkf.cn www.lpkf.cn

Hong Kong
LPKF Laser & Electronics (Hong Kong) Ltd.
Phone +852-2545-4005 hongkong@lpkf.com www.lpkf.com

Japan
LPKF Laser & Electronics K.K. Japan
Phone +81 (0) 3 5439 5906 info.japan@lpkf.com jp.lpkf.com

South Korea
LPKF Laser & Electronics Korea Ltd.
Phone +82 (31) 689 3660 info.korea@lpkf.com www.lpkf.com

Made in Germany

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