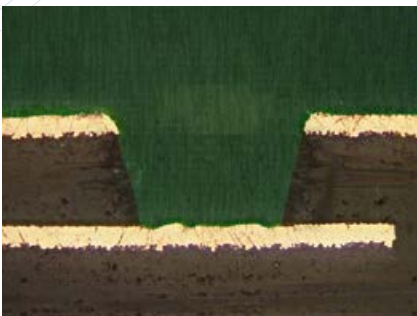
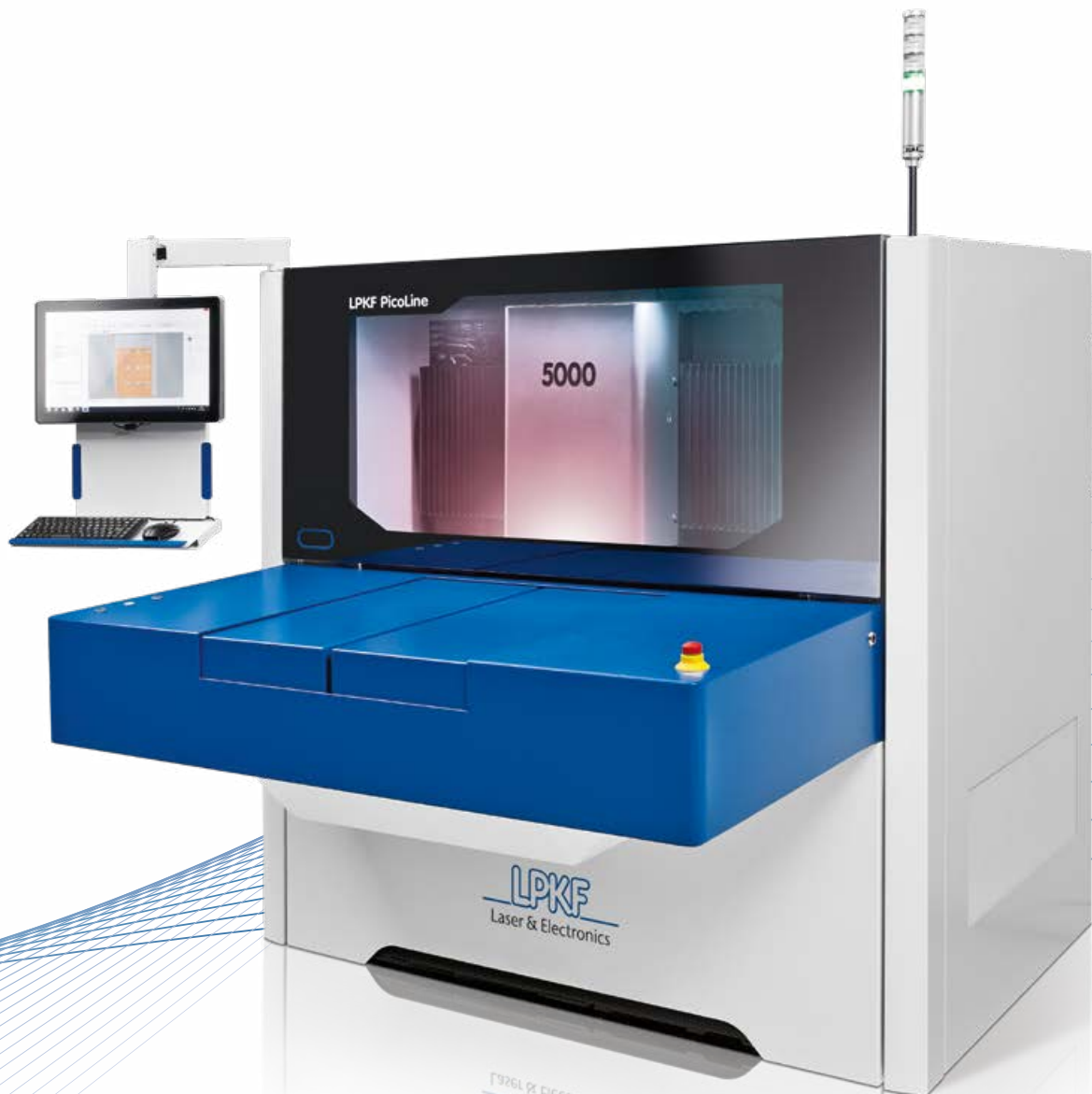


# Stress-Free Laser Cutting and Drilling of Circuit Boards

## Multipurpose Systems based on the LPKF 5000 Platform



# Laser Machining of Circuit Boards

## Cutting and Drilling of Rigid Circuit Boards, FPCBs, and Coverlayers: Application-Specific, Stress-Free, Fast

The laser is an effective precision tool for drilling and cutting of a wide range of circuit board materials. Through exact and particularly narrow drilled holes and cuts, it enables maximum utilization of the base material area – and also meets especially demanding requirements for speed and quality.

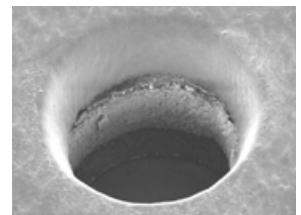
LPKF laser systems offer first-class solutions with simple handling, low space requirements, and short changeover times. This puts printed circuit board manufacturers at the forefront of today's on-demand market with outstanding machining results.

The LPKF laser solutions have been designed especially for micromachining in a 24/7 manufacturing environment in which, apart from the most continuous

system availability possible, a high yield is decisive. They are used successfully in numerous industries, especially for advanced precision applications in circuit board machining. Users also profit from the flexibility of the user-friendly system control.



Clean cut edges:  
FR4 as an example



No ejected material around hole  
edge: SEM micrograph of a hole  
in LCP

## Multipurpose or Special System: Find your Perfect Match in the LPKF System Portfolio

With the various laser options and the different properties of the LPKF systems, the right balance between quality and costs can be found for a given application area. The LPKF laser technology is highly productive both for special applications with small volumes and for large series. The large working area of all systems ensures universal applicability.

- Loading either manually or automated using robot or reel-to-reel handling
- Easy adaptation to various handling requirements in the electronics industry
- UV laser with integration of different laser powers according to requirements
- Pulse widths in the nanosecond or picosecond range

System	MicroLine 5115	MicroLine 5127	PicoLine 5440
Laser power	15 W	27 W	40 W
Wavelength	355 nm	355 nm	355 nm
Pulse width	~ 15 ns	~ 20 ns	~ 10 ps
Positioning accuracy	± 20 µm	± 20 µm	± 20 µm
Diameter of focused laser beam	20 µm	20 µm	25 µm
Max. working area (X x Y x Z)	533 mm x 610 mm x 11 mm (21" x 24" x 0.43")		
System dimensions (W x H x D)	1660 mm x 1720 mm x 1900 mm (66" x 68" x 75")*		
Weight	~2000 kg (~4400 lbs)		
Power supply	400 VAC, 3-phase, 50 – 60 Hz, 16 A, up to 6.5 kVA		
CAM and control software	LPKF CircuitPro (included)		
Modes of operation	Manual/automatic		

\* Height incl. status light: 2200 mm (87")

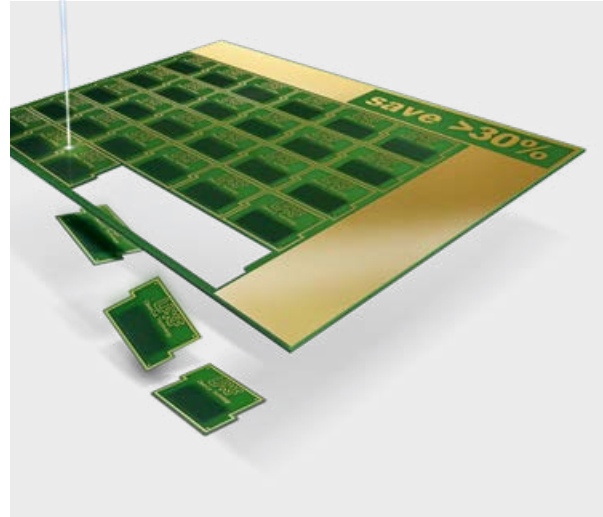
## Application Areas for the Laser Systems

For drilling, cutting, or ablation: with the laser processes developed by LPKF and suitably selected laser parameters, optimal machining of a wide variety of materials is possible. In the implementation of the machining tasks, the customer-specific designs are harmonized with the respective process efficiency requirements.

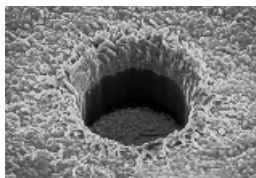
The process is gentle on the material:

- No thermal or mechanical stresses
- Technically clean and burr-free cut edges

Depending on the material and the depth, machined cavity walls tend to taper along the wall height to varying extents. LPKF cutting processes generate side walls with perfect geometries perpendicular to the surface. That benefits all applications.



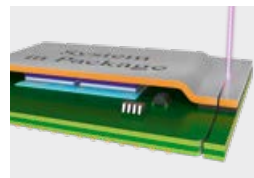
Material savings of more than 30% through full-section cuts in boards by the laser



### Drilling Microvias

Increased yield in the electroplating steps through high-quality, perfectly formed vias. Clean, smooth

side walls resulting in reliable circuits – even for HF applications.



### SiP (System-in-Package) Machining

Cutting, removing, or drilling of a multitude of IC compounds. Realizes cuts with

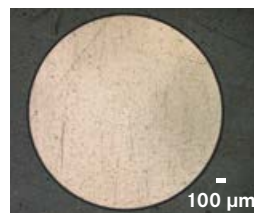
extremely fine contours. High positioning accuracy specifically for the requirements of the electronics industry.



### Cutting Cover Layers

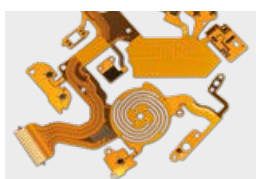
Clean edges, smooth cuts; with effective cutting speeds of up to 500 mm/s. Extremely thin foils can be

precisely and cleanly machined.



### PCB Skiving Ablation

Selective ablation process in which a material is removed with or without the underlying material being affected.

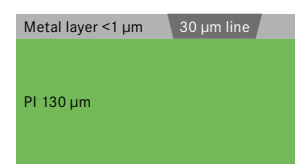


### PCB Routing – Cutting

Cutting of even ultrafine contours at high speeds. First-class UV laser beam diameter of 20 µm. Quasi-

geometric freedom enables, for example, minimized radii.

- Ablation of organic layers on inorganic substrates
- Ablation of inorganic layers on organic substrates



Example: metal ablation

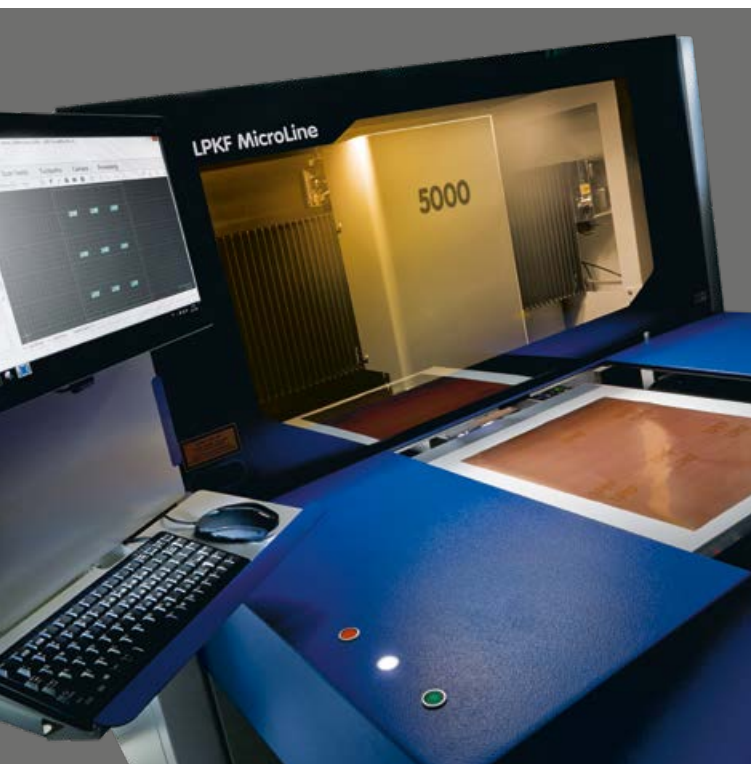
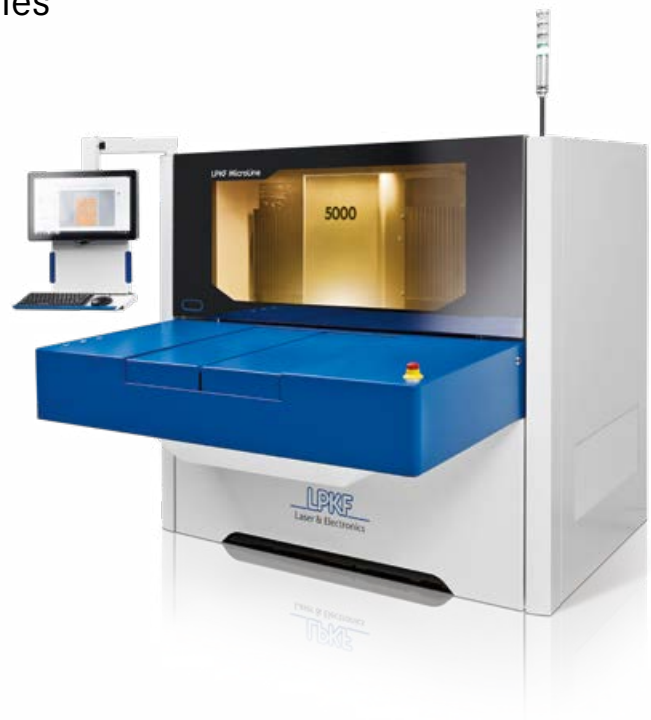
## Laser Systems in the LPKF Micro Series

The LPKF Micro series comprises UV laser systems that are predestined for use in the manufacturing of flexible printed circuit boards.

- Drilling of through holes and blind vias
- Cutting of large mounting holes
- Contour cutting of irregular board outlines

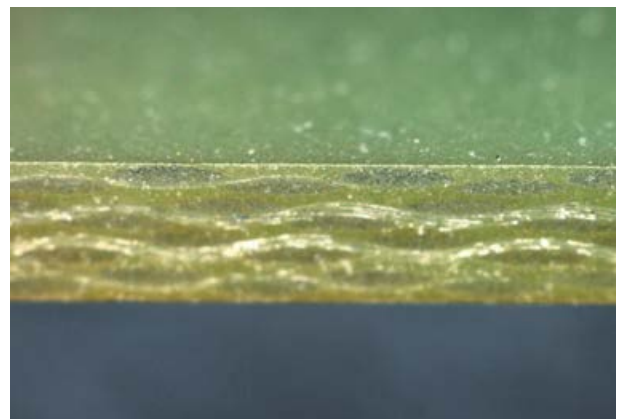
These LPKF systems can drill holes with diameters as low as 20 µm in a variety of organic and inorganic substrates. The manufacturing processes of cutting, drilling, and blind via drilling with the LPKF Micro systems find application in flexible PCB materials, IC substrates, and high-density interconnect (HDI) PCBs.

A system-integrated vision system provides for fast fiducial recognition and thus precise alignment. The integrated power measurement feature determines the laser power on the material plane for reliable and reproducible control.



### MicroLine 5000: Laser Systems for Cutting and Drilling

The MicroLine 5000 is a universal tool for circuit board machining. The high-quality UV laser is also suitable for cutting complex contours at high speeds.



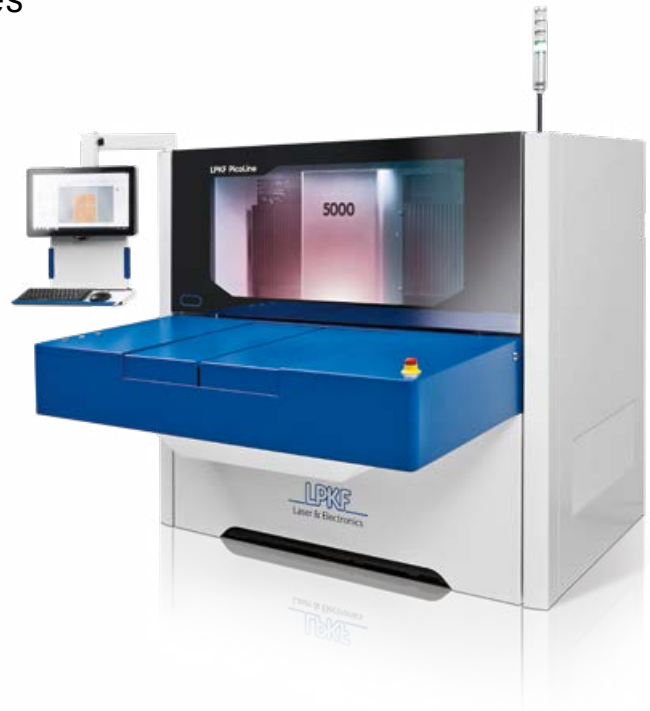
MicroLine 5000: Cut edge of FR4

## Laser Systems in the LPKF Pico Series

Industrial applications in which the total machining time is decisive profit from the use of ultrashort-pulse laser technology. With the picosecond laser systems based on the proven 5000 platform, LPKF satisfies the highest demands for quality and cutting speed.

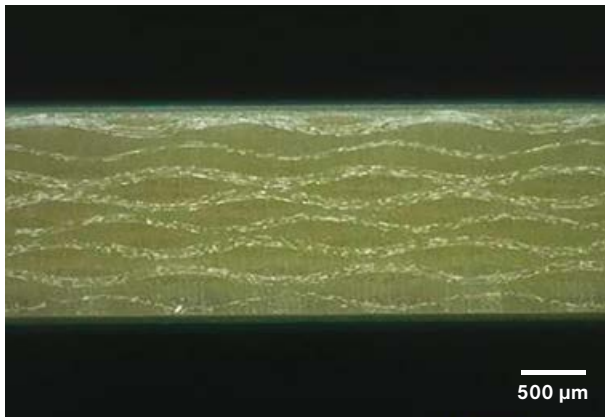
Systems in the LPKF Pico series provide for high-precision processing of circuit board materials such as FR4 and PI-, LCP-, and PTFE-FPC in all common industry panel sizes:

- Drilling of microvias with perfect via form
- Clean and material-saving cutting of circuit boards
- Generation of ultrafine structures with a line-to-space ratio of  $20\text{ }\mu\text{m} / 20\text{ }\mu\text{m}$  (1:1)
- Pocketing in flexible board materials
- Processing of IC substrates and high-density interconnect PCBs



### LPKF CleanCut: 100 % Clean Cutting

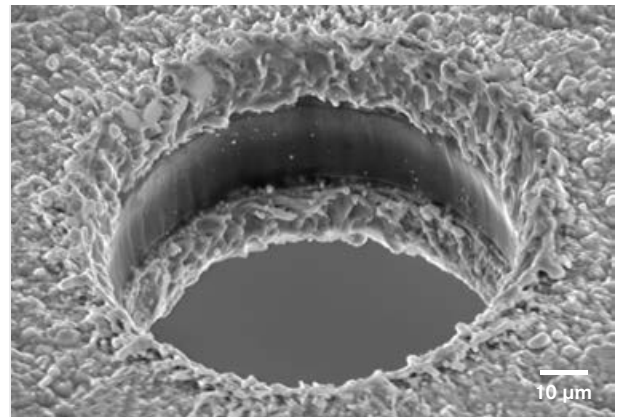
With the CleanCut technology, LPKF goes one step further. LPKF CleanCut provides a never-before-seen cut edge quality with absolutely no material carbonization. It makes reworking of edges a thing of the past.



Zero carbonization

### PicoLine 5000: Clean Cutting and Precise Vias – Surpasses Common Industry Standards

Versatile and efficient: the LPKF PicoLine 5000 ultra-short-pulse (USP) system stands for highly precise positioning and accurate processing of common industry PCB materials and panel sizes. Through the CleanCut and short pulse technologies, the heat-affected zone (HAZ) in the material is negligible.



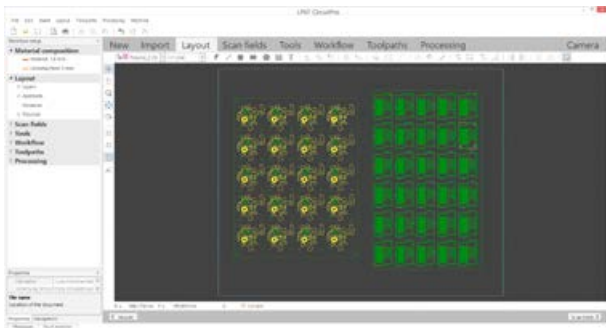
Through-hole via

## LPKF for you

To demonstrate our capabilities to you, we offer processing of customer-specific sample panels. With this step, we ensure that the planned project requirements with respect to cycle time, precision, and quality are met. Thanks to the user-friendly system software, you can easily achieve the same results in-house.

## LPKF Software

All LPKF laser systems are supplied with powerful system software. It is easy to use, perfectly coordinated with the hardware, and compatible with all standard programs used in the printed circuit board industry. The software precisely processes the required data from the circuit board manufacturer and guides the user through all the steps in the manufacturing process.



### Advantages of the CircuitPro Software:

- CAM data preparation and machine processing in a single software package
- Complete project information in one project file
- Optionally available as an Office version
- Input formats: Gerber, GerberX, DXF, HPGL, Sieb&Meier, Excellon, HPGL, DXF
- Support for 11 languages
- SMEMA interface

## LPKF Service

LPKF is known for its globally leading role in the development of high-quality, easy-to-use laser machines specially tailored to customer requirements. From this leading position, LPKF offers you worldwide first-class customer support.

We can provide technical customer service, installation, and training on request. We can also support you in the optimization of your processes.

You can rely on us for support, even over the long term. For this, we have compiled special service packages – Basic, Classic, and Premium – to meet your needs.



**LPKF Service & Support**

LPKF provides worldwide premium customer support. Learn more: [www.lpkf.com/support](http://www.lpkf.com/support)





Made in Germany

### Worldwide (LPKF Headquarters)

LPKF Laser & Electronics AG Osteriede 7 30827 Garbsen Germany  
Phone +49 (5131) 7095-0 [info@lpkf.com](mailto:info@lpkf.com) [www.lpkf.com](http://www.lpkf.com)

### North / Central America

LPKF Laser & Electronics North America  
Phone +1 (503) 454-4200 [sales@lpkfusa.com](mailto:sales@lpkfusa.com) [www.lpkfusa.com](http://www.lpkfusa.com)

### China

LPKF Tianjin Co., Ltd.  
Phone +86 (22) 2378-5318 [sales.china@lpkf.com](mailto:sales.china@lpkf.com) [www.lpkf.com](http://www.lpkf.com)

### Japan

LPKF Laser & Electronics K.K. Japan  
Phone +81 (0) 47 432 5100 [info.japan@lpkf.com](mailto:info.japan@lpkf.com) [www.lpkf.com](http://www.lpkf.com)

### South Korea

LPKF Laser & Electronics Korea Ltd.  
Phone +82 (31) 689 3660 [info.korea@lpkf.com](mailto:info.korea@lpkf.com) [www.lpkf.com](http://www.lpkf.com)

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