

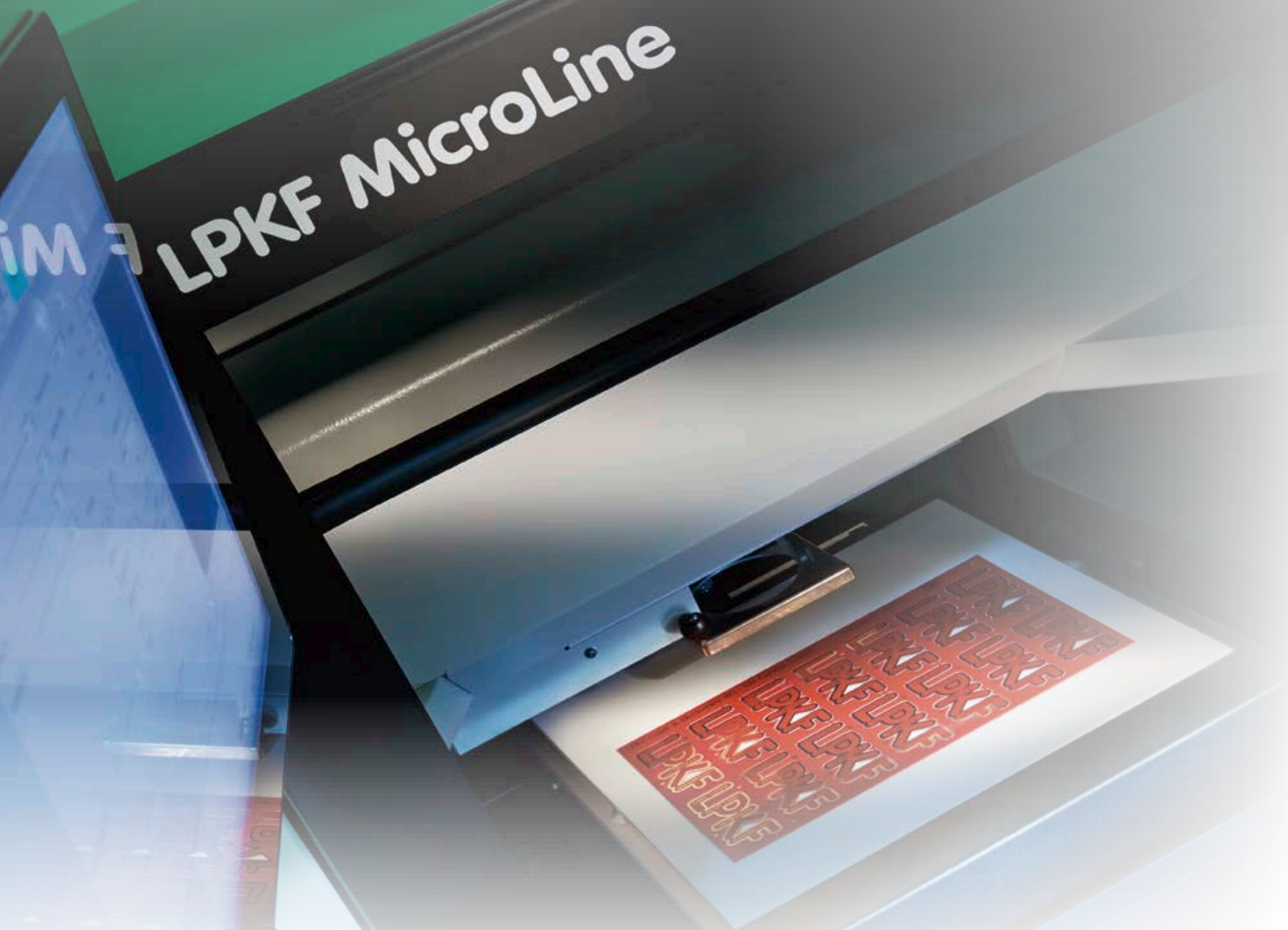
Precision Cutting for Printed Circuit Boards and Cover Layers

UV Laser Cutting with LPKF MicroLine 2000 Systems



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Beaming Cutting-Edge Technology

It is impressive how quickly, cleanly and precisely LPKF UV laser cutting systems can process even highly complicated tasks with printed circuit boards (PCBs). The LPKF MicroLine systems build on a solid track record. They are based on their successful predecessor model and are available in variants for cutting assembled PCBs, flexible PCBs and cover layers.

No Stress, no Burrs, no Particles

The advances in laser technology and in mechanical engineering promise more precision in cutting and separating rigid, rigid-flex and flexible PCBs and cover layers.

Even with complex shapes, the UV laser cuts any contours with minimal tolerances directly from the layout data, without the limitations of tool-based processes. The attached exhaust system reliably gathers the ablation products.

The clean cuttings of the LPKF MicroLine 2000 ensure there are practically no burrs or particles. The sensitive material is not mechanically stressed and even the heat-affected zone turns out to be very small – only a few micrometers.

The material removed by the laser energy is automatically discharged by the integrated exhaust. A continuous process monitoring protects the operator and the laser system.

- Cutting complex contours with the highest precision
- Working range up to 350 x 350 mm (13.8" x 13.8")
- Low energy and space requirement
- Easy operation
- Different laser sources

Low Investment and Operating Costs

The innovative MicroLine 2000 laser systems are already inexpensive to purchase. In addition, the laser process also reduces tool costs and changeover times. The laser systems are frugal with energy consumption and require little space. There are also application-specific, economical solutions for fixing the material. The combination of high machine availability and low unit costs speaks in favor of using the MicroLine 2000 UV lasers.

Flexible Production

If the cutting data change in the circuit board layout, the new contour can be produced in a short time on the LPKF MicroLine 2000 systems. UV laser cutting creates new freedom in production planning, from prototypes to series manufacturing – production on demand.

Easy Operation

A laser system is only as productive as the system software allows. The MicroLine 2000 laser systems include a field-tested CAM software. The layout data can be adopted there in CAD programs and quickly optimized for the desired machining processes. Stored projects are available at the press of a button. The LPKF CircuitMaster machine software is optimized for high processing speed and intuitive operation. The software provides various user levels for one push button operation or complete access to the process parameters.

The LPKF MicroLine 2000 systems are compact systems of laser class 1. The hood prevents unsecured intervention in the work process and the leakage of any laser radiation too. The large viewing window allows visual process monitoring.



MicroLine 2000 P – Processing Flat Substrates

Growing with the Tasks

UV laser cutting systems display their advantages at various positions in the production chain. With complex electronic components, the processing of flat materials is sometimes required.

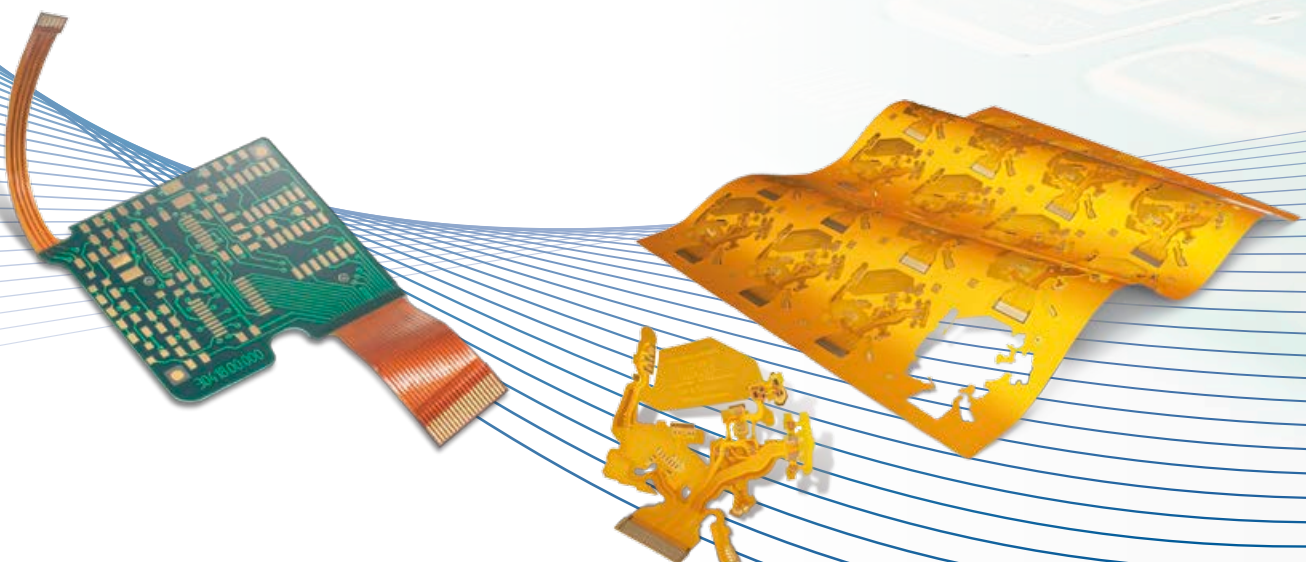
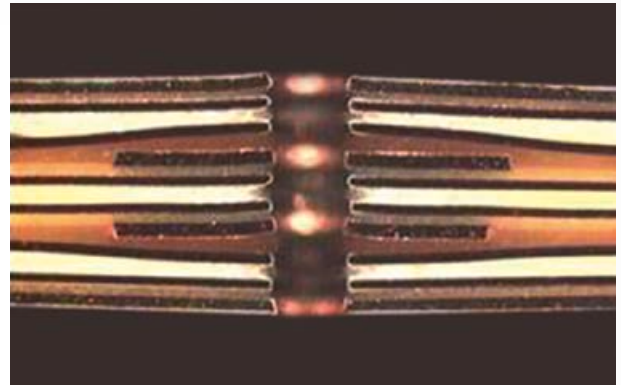
In that case, the UV laser reduces the lead time and tool costs with every new product layout. The LPKF MicroLine 2000 P is optimized for these work steps and can securely hold the substrates with an integrated vacuum table – there are no additional tool costs. In electronics manufacturing, for example, this means:

- Separating/cutting thin flexible substrates both with and without metallic conductive networks (e. g., cover layers or flexible PCBs)
- Cutting holes in flexible or thin and rigid PCB materials
- Separating flexible areas in the case of rigid-flex layouts
- Creating pockets in the substrate

Precision is the main focus: UV laser cutting requires hardly any space for the cutting channels. The laser focus has a diameter of just a few micrometers. Protection zones against mechanical influences are no longer necessary. Both effects lead to more circuit board panels finding space on the base material.

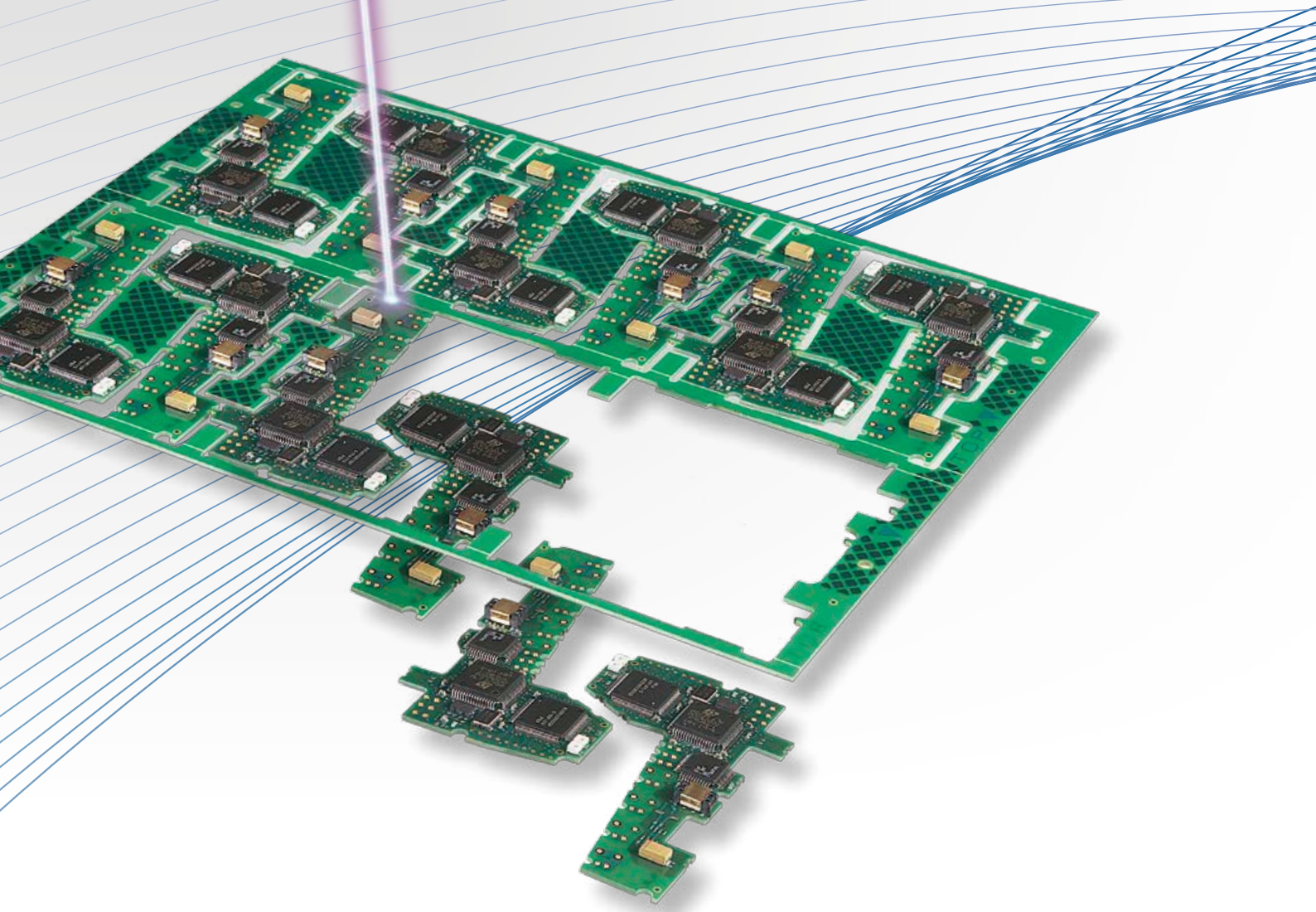
Cutting Holes and Decaps

The cutting process with the laser is very easy to control. Each laser pulse removes an exactly defined amount of material – with the substrate more, with metallic layers less. Depths can thus be precisely controlled: the cutting process stops when the desired depth is reached. The laser beam can then also be used to clean copper deposits in the layer that is reached.



- Complex contours
- No substrate brackets or cutting tools
- More panels on the base material
- Perforations and decaps





MicroLine 2000 S – Cutting Assembled Circuit Boards

Stress-Free for Material and Operator

The UV laser cuts substrates in the immediate vicinity of sensitive components or strip conductors – without mechanical stress. Smaller components can thus be produced with a noticeably higher assembly density up to the edge of the PCB – and at the same time the process reduces the reject rate.

Presupposing there is a suitable component fixture, the UV laser can also reliably cut components that are populated on two sides with a high level of mixed assembly. Since no mechanical forces have to be accommodated, the component fixtures turn out to be clearly less expensive in comparison to other processes.

Double Laser Power

The LPKF MicroLine 2000 P/S are equipped with various laser sources. With a laser output of 6 watts, flexible, rigid-flex and rigid-flex PCBs can be cut up to a thickness of ca. 0.8 mm.

Especially when cutting rigid PCBs, the stronger laser source with 12 watts provides a clearly higher throughput. This laser system cuts thinner substrates more quickly, but also allows economical processing of substrates up to a thickness of 1.6 mm.

- Circuit board thickness up to 1.6 mm
- Close to strip conductors or components
- Optimal utilization of the substrate

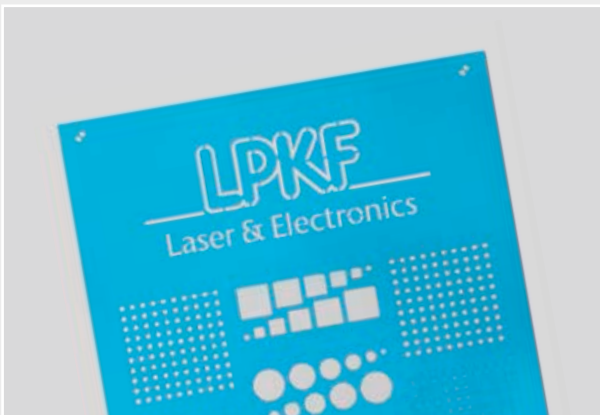
Vision System

An important factor for the success of the predecessor systems was the integrated vision system. A camera monitors the processing area and identifies the position of the circuit boards on the basis of fiducials. Geometrical deformations such as rotation or distortion within the base materials

can thus be evened out. The laser process thus obtains components that conform to standards from base materials that would have to be rejected in conventional processes. The fiducial recognition is done in the latest version around 100 % faster than before and can be more easily adapted to individual customer requirements.

Applications for UV Laser Systems at a Glance

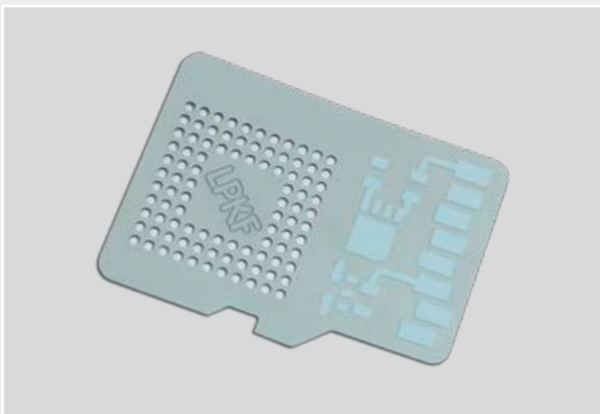
In industrial use, the LPKF UV laser systems have won broad approval in cutting PCB materials. In addition, some of the areas they are suitable for include the following areas of application:



Scoring, drilling and cutting of fired ceramics



Highly precise structuring of metal layers on ceramics



Cutting, drilling and engraving of unfired ceramic (green tape)



Processing TCO/ITO layers without impairment of the substrate

Laser Cutting with Worldwide Support

LPKF supports global users of its MicroLine UV laser systems from its application centers in Germany, the USA, Japan, Korea and China. Users have access to LPKF's many years of experience in laser material processing, including technical expertise, new processes and new applications. User training for technical employees and special consulting services complete the offer from the world market leader in PCB laser processing.

Technical Data: LPKF MicroLine	2000 P	2000 S
Max. working area (X x Y x Z)	350 mm x 350 mm x 11 mm (13.8" x 13.8" x 0.4")	
Max. recognition area (X x Y)	300 mm x 300 mm (11.8" x 11.8")	
Max. material size (X x Y)	350 mm x 350 mm (13.8" x 13.8")	
Data input formats	Gerber, X-Gerber, DXF, HPGL, Sieb & Meier, Excellon, ODB ++	
Max. structuring speed	Depends on application	
Positioning accuracy	± 25 µm (1 Mil)	
Diameter of focused laser beam	20 µm (0.8 Mil)	
Laser wavelength	355 nm	
System dimensions (W x H x D)	875 mm x 1 550 mm x 1 120 mm (34.5" x 61" x 44")*	
Weight	~ 450 kg (990 lbs)	
Operating conditions		
Power supply	115/230 VAC, 50 – 60 Hz, 1,5 (3**) kW	
Cooling	Air-cooled (internal cooling cycle)	
Ambient temperature	22° C ± 2° C (68° F ± 2° F)	
Humidity	60 % (non-condensing)	
Required accessories	Exhaust unit	Exhaust unit, production fixture

* Width including screen = 1 400 mm (55")

** Power consumption in configuration MicroLine 2820 P/S

MicroLine 2000 series systems feature multiple variations: MicroLine 2120 P (6 watt laser source) and MicroLine 2820 P (12 watt laser source), MicroLine 2120 S (6 watt laser source) and MicroLine 2820 S (12 watt laser source).

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