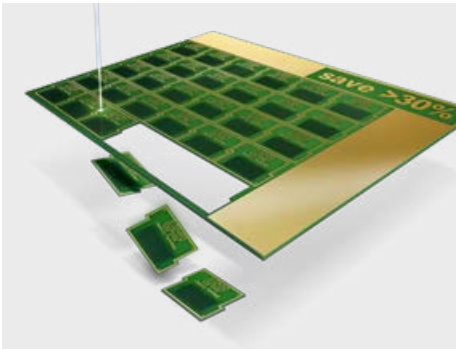


# Redefining the Economics of Laser Depaneling

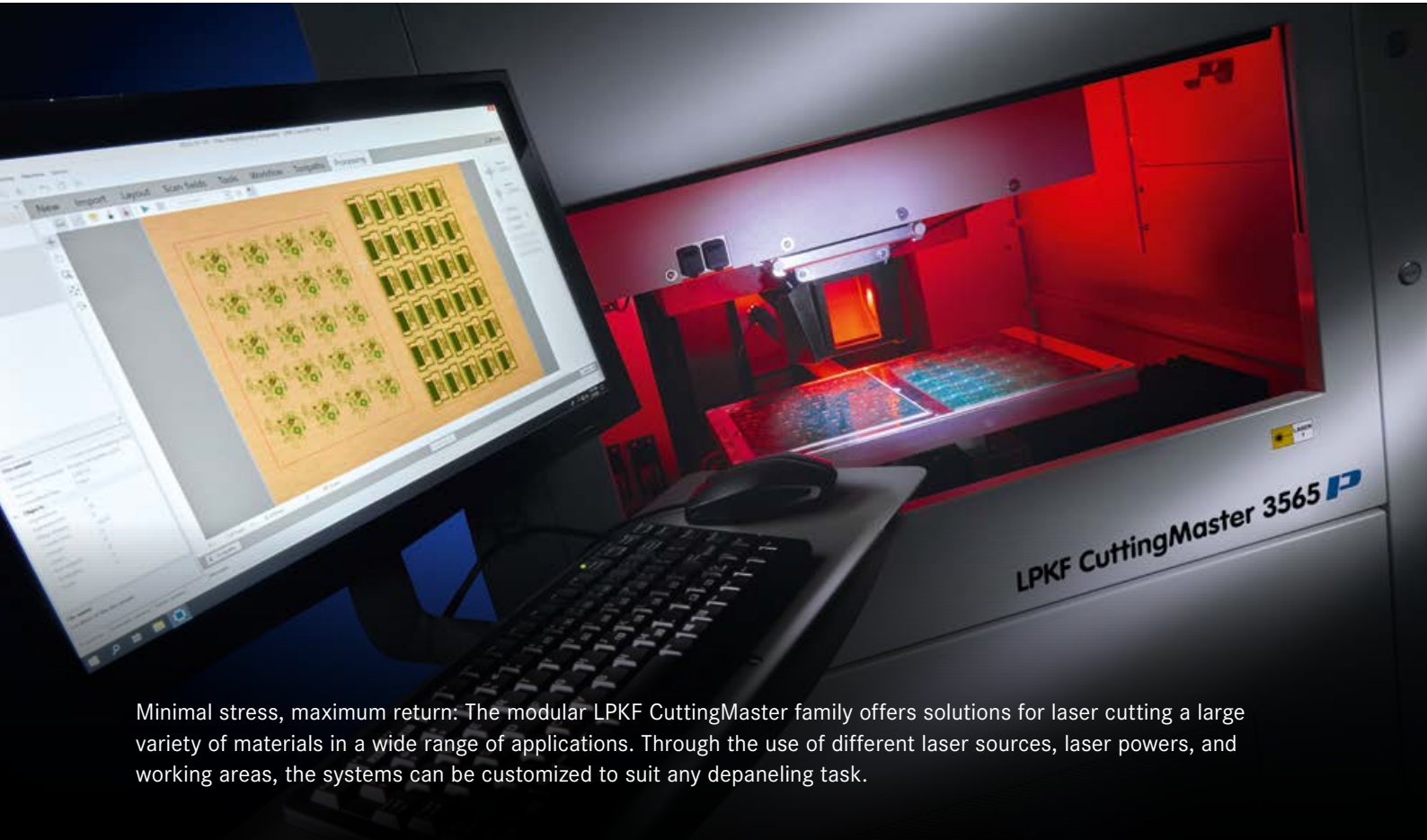
## LPKF CuttingMaster



**LPKF**

# Advantages for Depaneling

Outstanding Precision, Superior Performance, Optimal Cutting Quality



Minimal stress, maximum return: The modular LPKF CuttingMaster family offers solutions for laser cutting a large variety of materials in a wide range of applications. Through the use of different laser sources, laser powers, and working areas, the systems can be customized to suit any depaneling task.

**Accuracy:** The synergies between the high-quality hardware and the specially developed, technically refined software result in high precision and high productivity.

**Cost Efficiency:** A CuttingMaster system gives you maximum laser cutting quality at the price of conventional depaneling systems.

**Cleanliness:** The application-specific configuration of the laser process ensures clean cut edges and contamination-free surfaces throughout the process.

**Reliability:** The CuttingMaster systems have established themselves in demanding industries such as the automotive industry, medical technology, and consumer electronics and have been optimized for 24/7 production.

**Versatility:** A wide range of materials from rigid to flexible can be processed; with the universal workpiece carrier solution, inexpensive and easy handling of a wide variety of products is possible.

**Speed:** Fast processing is ensured through the continuous process optimization and the high performance level of the machine.

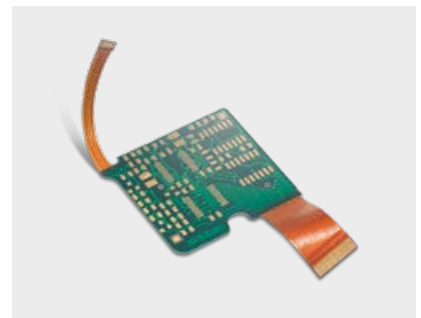
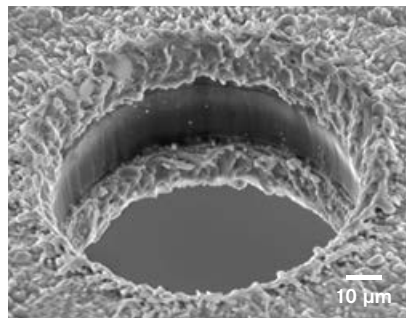
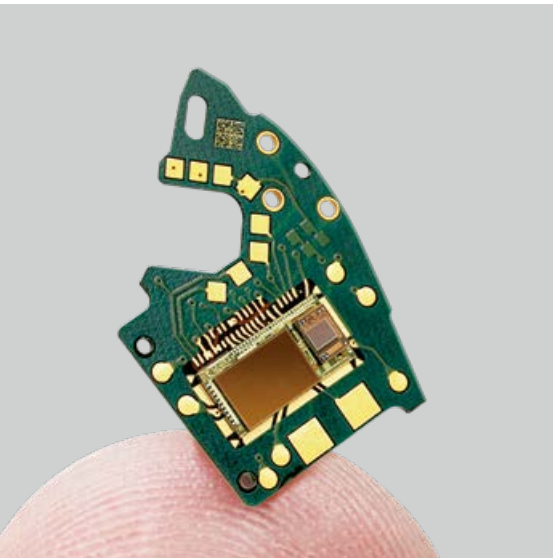
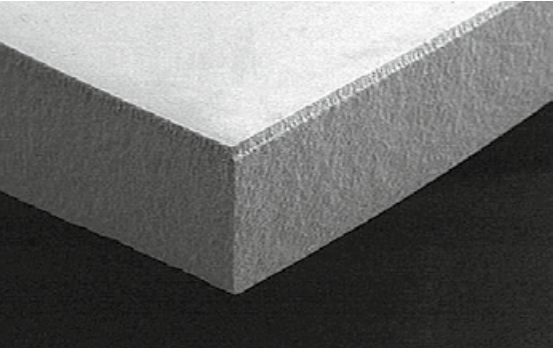
**Automation:** Laser depaneling can be designed as a fully automated process on request.

**Material Savings:** Stress-free, noncontact material processing and cut channels of just a few  $\mu\text{m}$  allow for more efficient material utilization.

**Optimal Service:** Worldwide premium customer support.

# Maximum Flexibility

Wide Range of Applications and Processing Options



With its simple software-based adaptation, the laser offers virtually limitless application and processing possibilities.

Applications:

- FR4 substrates
- Ceramics
- Flexible printed circuit boards
- IC substrates

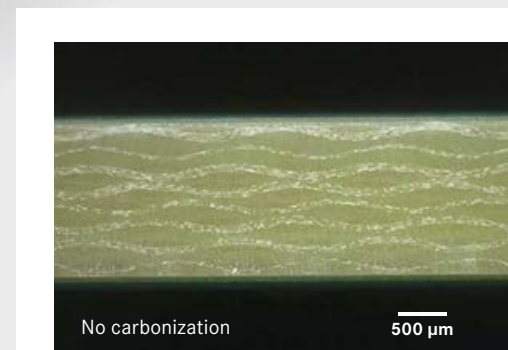
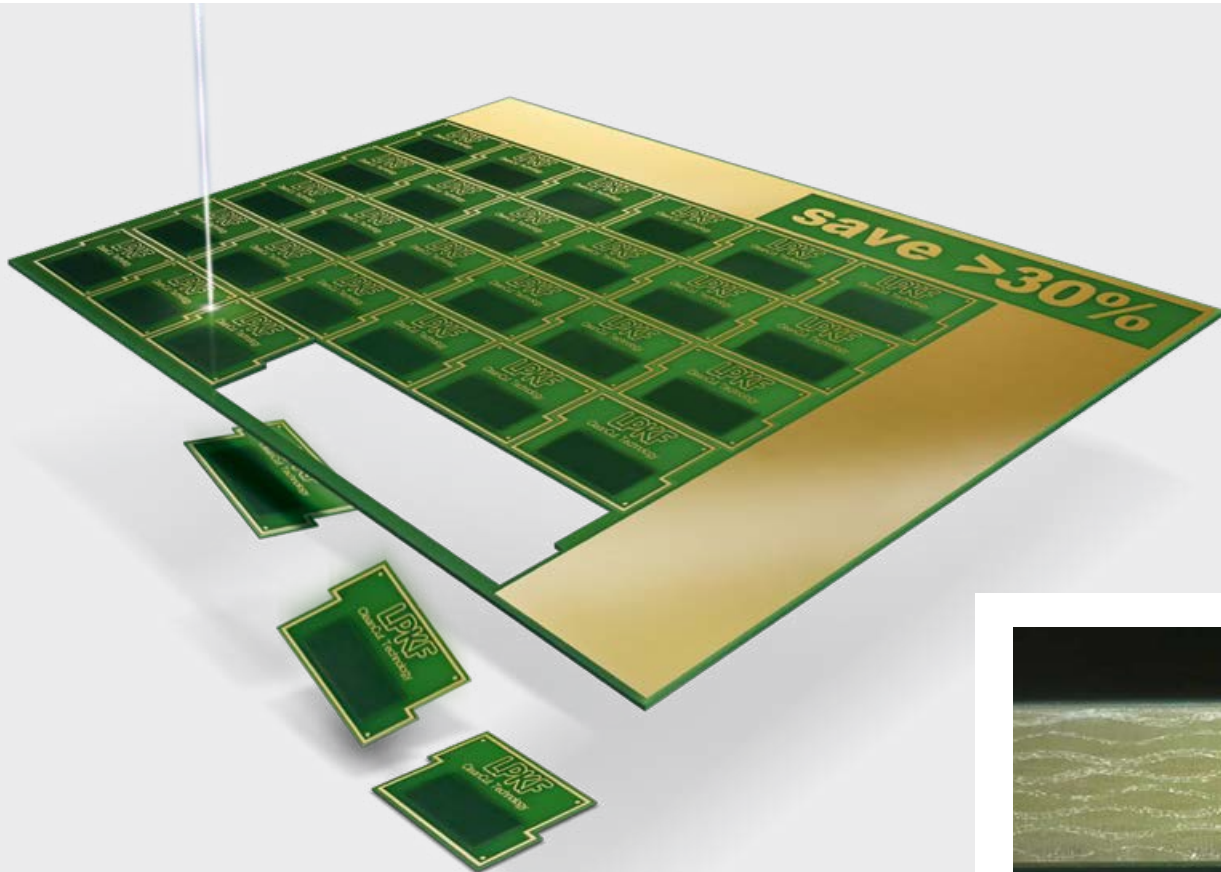
## Processing Capabilities

Due to the layerwise, pulsed ablation, the laser offers a wide range of processing options:

- Cutting
- Drilling
- Marking
- Structuring

# LPKF CleanCut Technology

Stress-free and Clean Cutting of Rigid and Flexible Printed Circuit Boards



## Why Laser Depaneling?

Laser depaneling offers numerous advantages over conventional depaneling methods: Noncontact separation results in a stress-free process for the part. The surrounding material is not stressed, and edges can be cut very close to mounted components. This results in a higher density and, especially for full cut, significant material savings.

The laser generates very narrow cut channels – with maximum precision. Numerous flexible and rigid materials can be processed. The digital, software-based, and laser beam-guided method allows cuts of nearly any geometry to be made.

Furthermore the laser – a light-based tool – is very wear-resistant. Material ablation occurs with no contact of the material. As a result, the costs incurred

in mechanical depaneling processes for consumables and changeover are done away with. The LPKF laser systems are designed for 24/7 production. They are ideal for sensitive applications as are found in medical technology, the automotive industry, and consumer electronics.

## LPKF CleanCut Technology

The cuts generated with the LPKF CleanCut process exhibit outstanding precision and technical cleanliness. Milling dust, carbonization, and other contaminants are a thing of the past. The result is maximum functional reliability of the manufactured PCBs.

# LPKF CuttingMaster Systems

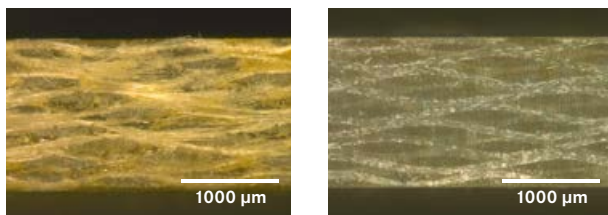
An Optimal Solution for Every Depaneling Application

## LPKF CuttingMaster 2000 – The Most Cost-Efficient Laser Depaneling System

The extremely compact CuttingMaster 2000 series saves valuable space in your production facility. The system is also available with the Tensor and CleanCut technologies for technically clean cut edges and high performance.

The CuttingMaster 2000 is a powerful system that offers a high throughput at an attractive price. Consequently it can compete with mechanical milling in terms of price and performance and also offers greater flexibility and delivers much higher quality.

- Optimal price-to-performance ratio
- Tensor and CleanCut technologies
- Compact design



Cut edges of milled (left) and laser-cut (right) FR4 material. Clearly visible: After the milling process, the edge shows open structures with fraying; laser cutting generates a closed surface.



LPKF CuttingMaster	2000 P	2000 Ci
Max. working area (X x Y)	350 mm x 350 mm	350 mm x 250 mm
Positioning accuracy	± 25 µm	
Diameter of focused laser beam	~20 µm	
System dimensions (W x H x D)	875 mm x 1578 mm x 1143 mm*	
Weight	450 kg	
Optional features	Production fixture, MES connection, UPS (uninterruptible power supply), universal workpiece carrier, automatic power measurement, automatic conveyor width adjustment	

Laser power	Wavelength	Pulse duration	2000 series	CleanCut	Tensor
22 W	355 nm (UV)	Nanosecond	2122	•	• **
27 W	355 nm (UV)	Nanosecond	2127	•	• **
40 W	532 nm (green)	Nanosecond	2240	•	•
46 W	532 nm (green)	Nanosecond	2246	•	•

\* Height incl. status light: 2198 mm    \*\* Soon available

## LPKF CuttingMaster 3000 – The Most Flexible and Precise Laser Depaneling System

The CuttingMaster 3000 systems are equipped with linear drives. This ensures a very high positioning accuracy and, as a result, outstanding quality. Compared with the 2000 series, the 3000 series has a greatly expanded working range.

The system is capable of integrating a wide range of laser sources with different wavelengths and pulse widths in the nano- or picosecond range. There are also variants incorporating Tensor technology. This allows the systems to be used for a wide range of applications and a great variety of materials. The robust granite table of this series guarantees reliable precision.

- Large working area
- Highest precision
- Tensor and CleanCut technologies
- Maximum flexibility



Integration into production lines: CuttingMaster Ci variant



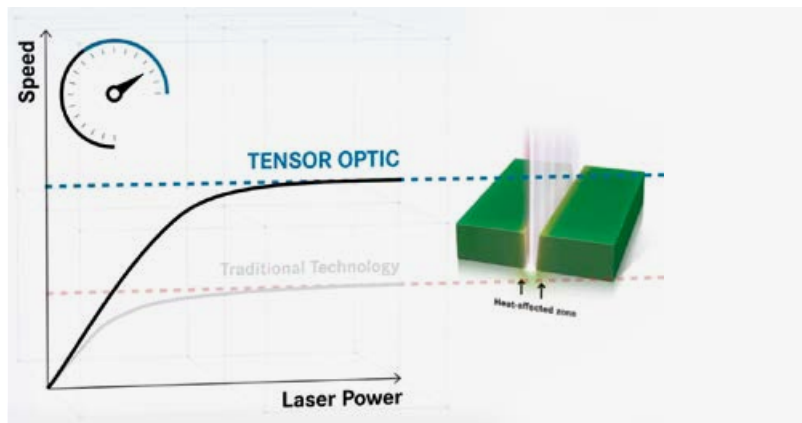
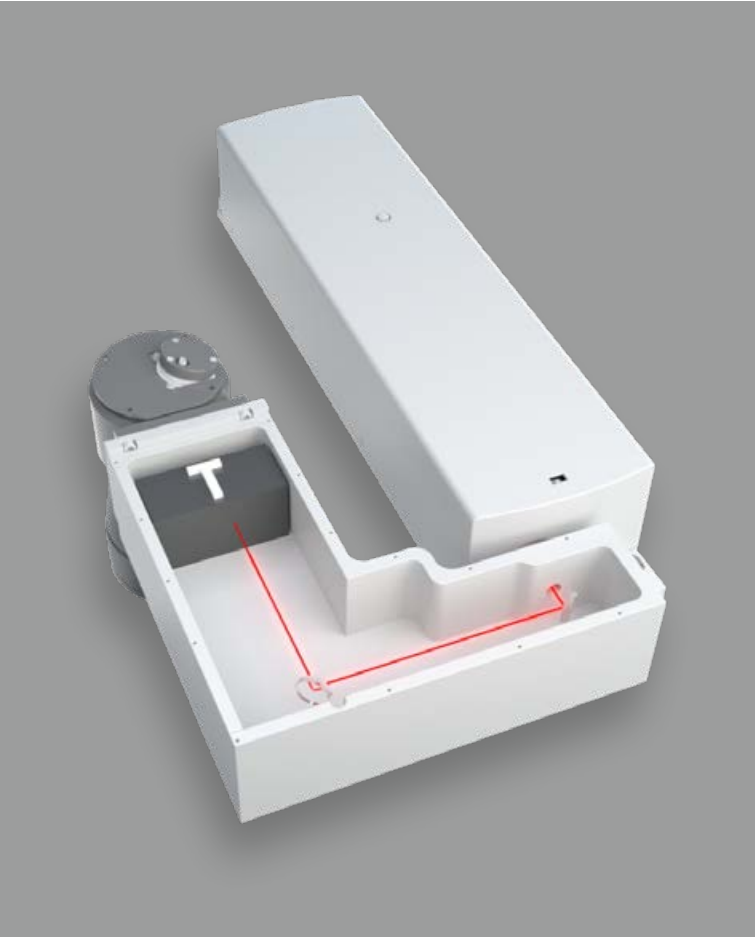
LPKF CuttingMaster	3000 P	3000 Ci
<b>Max. working area (X x Y)</b>	500 mm x 350 mm	460 mm x 305 mm
<b>Positioning accuracy</b>	± 20 µm	
<b>Diameter of focused laser beam</b>	~20 µm	
<b>System dimensions (W x H x D)</b>	1050 mm x 1500 mm x 2000 mm*	
<b>Weight</b>	1300 kg	
<b>Optional features</b>	Production fixture, MES connection, UPS (uninterruptible power supply), universal workpiece carrier, automatic power measurement, automatic conveyor width adjustment	

Laser power	Wavelength	Pulse duration	3000 series	CleanCut	Tensor
27 W	355 nm (UV)	Nanosecond	3127	•	• **
46 W	532 nm (green)	Nanosecond	3246	•	•
24 W	355 nm (UV)	Picosecond	3424	•	• **
65 W	532 nm (green)	Picosecond	3565	•	•

\* Height incl. status light: 2120 mm    \*\* Soon available

# LPKF Tensor Technology

Unique Combination of Quality and Performance



The unparalleled patented beam deflection technology surpasses the previously established systems of the CuttingMaster platforms with its capabilities and performance. It gives users a clear competitive advantage.

**Enhanced Performance:** Tensor is an ultrafast beam deflection technology. Especially in conjunction with LPKF CleanCut for technically clean depaneling of printed circuit boards, the technology enables cycle times to be reduced by up to 70% and significantly increases the performance potential.

**Solution to a Fundamental Problem:** The accelerated deflection solves a fundamental problem in laser processing. Previously, an increase in laser power did not always mean a corresponding increase in performance because it potentially necessitated an additional cooling phase. Thanks to Tensor, this is no longer true.

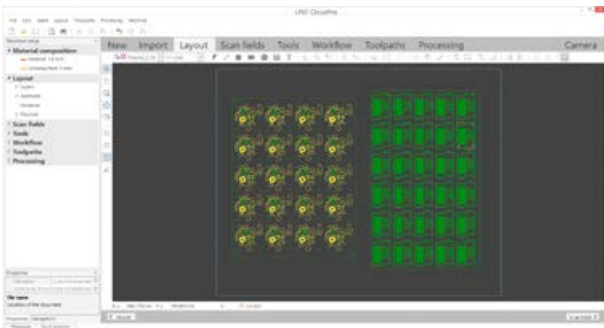
**Unique Set of Advantages:** Tensor scores with a unique combination of advantages: maximum transmission, high robustness, and, as a result, excellent reliability. The ingenious and slim Tensor solution also makes rapid guidance of the laser beam possible at previously unrealizable conditions. In this way, the cost efficiency of the systems can be improved even further.

## Increase the Value of Your Products With LPKF Systems

We are committed to ensuring that our laser systems produce the best possible results for you. Therefore, we do everything we can to make the machines as ideal and easy-to-operate as possible. Our engineers develop optimum machine software with all the features you will need for a smooth production operation in your factory. You can reach us anytime if you require training, maintenance, or other service options. Process your depaneling tasks with LPKF hardware, software, and services: This will guarantee that your products are as perfect and reliable as possible.

### LPKF Software

All CuttingMaster systems come with powerful system software. It is easy to use, perfectly matching 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.



### 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 put together special service packages – Basic, Classic, and Premium – tailored specifically to your needs.

### Optional Software Extensions:

- Standardized OPC UA interface
- Bad board part detection and handling
- SMEMA and HERMES interfaces
- Marking of codes and texts
- Reading of 1D and 2D codes



**LPKF Service & Support**

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





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