Processing Sensitive Substrates with UV Laser
Quality in a New Dimension
LPKF MicroLine 6000 P
Cost-Effective Laser Processing for Printed Circuit Boards

Demand-driven rhythm: today’s sophisticated production plans are pushing processing systems to their limits as product portfolios become more extensive and unexpected layout changes become more frequent. At the same time, cutting quality requirements are increasing. The LPKF MicroLine 6000 P laser system meets these requirements by providing cost-effective industrial laser processing with highly precise results.

High Cutting Speed, Low Costs
The LPKF MicroLine 6000 P laser system increases production planning while also lowering total cost of ownership. These two goals were the focus in further developing the system for model year 2012. The current system masters the balance between high quality and high throughput. The easy automation feature allows automatic execution of the entire process sequence.

A Worthwhile Investment
Using the LPKF MicroLine 6000 P pays off quickly. Its speed and precision create a decisive competitive advantage, while dropping processing time for PCBs and virtually eliminating tool costs in comparison to conventional methods.

Turning challenges into advantages: the MicroLine 6000 P not only cuts rectangular boards but also drills holes and makes cuts along any contours. A vacuum table holds the boards securely in position. In the cutting process itself, there are practically no mechanical or thermal stresses on the component. A vision system monitors the relative position of the laser to the board and noticeably helps increase the number of accepts.

Worldwide Support
With automatic beam adjustment, LPKF was able to significantly lower the calibration outlay during installation and ongoing operation. The new LPKF MicroLine 6000 P has a self-adjusting laser system that becomes active under both thermal influences and component replacement. The laser beam always hits its target without requiring manual setting.

All LPKF MicroLine customers have a direct line to service locations in Germany, the USA and Asia, where they receive support for new projects or processes and profit from the extensive experience of our specialized project engineers. These service centers also manage employee training and service installed systems.
• Minimum tool costs
• Complex contours – without set-up outlay
• Flexible production planning
• Low maintenance outlay in 24/7 operation
• Limited production waste
LPKF MicroLine 6000 P
Easy Automation
Due to the integrated SMEMA interface, the LPKF MicroLine 6000 P laser processing system easily combines with all types of handling systems.

Clean Process
LPKF laser systems are always delivered with a high-capacity exhaust and filter unit, keeping the work environment and the laser optics clean and protecting the components from contamination.

Automatic Beam Correction
Active elements in the beam path continuously detect and optimize the position of the laser beam. This enables the LPKF MicroLine 6000 P to achieve optimal processing results, even after replacing components or changing ambient conditions. The processing power is also continuously detected and adapted to the chosen process parameters.

Manual calibration work is almost completely eliminated, enabling the system to rapidly resume production following servicing.

Linear Actuators
Linear actuators for laser head movement are quick, precise and maintenance-free, contributing to the performance of the entire system.

Integration in MES Solutions
The MicroLine 6000 P seamlessly integrates into existing manufacturing execution systems (MESs). The laser system delivers operative parameters, machine data, tracking & tracing values and information about individual production runs.

Vacuum Table
The integrated homogenous exactly even levelled vacuum system keeps sensitive components and materials securely in place.

Material Position Detection
The vision system not only detects the contours of entire panels, but also detects contour features of individual components, increasing the chance of making components from deformed originals that still conform to standards.

• Versatile
• Easily combined with handling systems
• Self-adjusting beam position
• 610 mm x 533 mm (24” x 21”) operating range
Broad Range of Materials

In the industrial field, the LPKF MicroLine 6000 P systems are optimized for precise processing of thin, flexible material lines. These new capabilities also make the system a perfect tool for a variety of applications.

Flex-Rigid Circuitry and Decap Applications
Thanks to its high level of process stability, the UV laser of the LPKF MicroLine 6000 P cuts with reliable depth monitoring, a critical precondition for separating rigid components from the flexible components of flex-rigid circuitry.

When creating pockets, individual layers of a multilayer are precisely cut out so as to embed components – the UV laser is exceptionally well-suited for this application.

Cutting Rigid and Flexible PCBs
Because the stress-free laser cutting process impairs neither strip conductors nor components, cut edges are much closer to the borders of the electronic layout. The components get smaller, but there is still room on the panel. Higher packing densities can be achieved with the LPKF laser system because the system cuts very close to the components.
• No thermal or mechanical stress
• Particle-free cuts
• Premium precision
• Material processing with depth monitoring

Cutting Cover Layers
The level of integration required for complex electronic products can only be achieved with the precision and fineness of laser technology. Cover layers protect the surfaces of complex printed circuit boards. The laser cuts cover layers with tiny openings and even irregular contours without mechanical influences.

More Flexibility
The UV laser wavelength makes the LPKF MicroLine 6000 P a multi-talented system. Since no tools are required for fixing or the cutting process and only layout data need to be adapted, the system is suitable for a wide variety of applications, such as:

• Structuring of invisible conducting layers on plastic or glass (TCO/ITO)
• Precisely opening solder resists. Completely blank pads come about through the laser process without subsequent cleaning
• Structuring, drilling and cutting ceramic base materials
• Fine structuring of metal layers (e.g., Cu, Ni, Au) on fired ceramics (e.g., Al₂O₃).
**Enjoy Worldwide Support**

MicroLine UV laser system users all over the world enjoy a direct connection to our application centers in Germany, the USA, Japan and China. There they receive support for their new project, new processes, and applications based on LPKF’s years of experience in laser material processing. Training for your operating staff and technical service complete your relationship with the world leader in PCB laser processing. Please contact LPKF for application reports and further information.

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### Technical Data: LPKF MicroLine 6000 P

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>Max. material size (X/Y/Z)</td>
<td>533 mm x 610 mm x 50 mm (21” x 24” x 2”)</td>
</tr>
<tr>
<td>Max. recognition area (X/Y)</td>
<td>533 mm x 610 mm (21” x 24”)</td>
</tr>
<tr>
<td>Data input formats</td>
<td>Gerber, X-Gerber, DXF, HPGL, Sieb &amp; Meier, Excellon, ODB ++</td>
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<tr>
<td>Max. structuring speed</td>
<td>Depends on application</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 20 µm (0.8 mil)*</td>
</tr>
<tr>
<td>Diameter of focused laser beam</td>
<td>20 µm (0.8 mil)</td>
</tr>
<tr>
<td>Laser wavelength</td>
<td>355 nm</td>
</tr>
<tr>
<td>System dimensions (W/H/D)</td>
<td>1,800 x 1,770 x 1,440 mm (70.8” x 69.7” x 56.7”)</td>
</tr>
<tr>
<td>Weight</td>
<td>~1,900 kg (4,190 lbs)</td>
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**Operating conditions**

- **Power supply**: 400 V, 3 phases, 5.6 kW**
- **Cooling**: Air-cooled (internal cooling cycle)
- **Ambient temperature**: 71.6° F ± 4° F
- **Humidity**: < 60% (noncondensing)
- **Required accessories**: Exhaust unit, compressed air supply (0.6 MPa)
- **Hardware and software requirements**: Standard industry PC and CAM system software included

* Positioning accuracy  ** Includes exhaust unit (1.2 kW)

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**MicroLine 6000 P series systems feature two variations: MicroLine 6120 P (6 watt laser source) and MicroLine 6820 P (12 watt laser source).**

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