LPKF ProtoLaser H4 – Enhanced Tabletop System for Fast PCB Processing

Take your lab to the next level: Combine the advantages of mechanical drilling of thick substrates including multilayers with extremely fast, contactless, laser surface processing in one tabletop system. This compact and economical solution is based on the proven concept of the LPKF ProtoLaser and LPKF ProtoMat systems. In combination with LPKF CircuitPro software, it guarantees smooth and seamless operation based on your CAD data.

Plug & play, all-in-one, desktop entry level laser system, comes with built-in computer and software. Only power supply, compressed air and dust extraction need to be connected to process standard single and double-sided FR4 materials, some single-sided RF, PTFE or ceramic filled materials as well as certain flex substrates like Al on PET with 100 µm/30 µm line/space. Flexible materials and foils can be freely positioned and fixed precisely on a vacuum table.

The vision alignment, 14 tool positions, the MTM (Material Thickness Measurement) as well as numerous software-defined laser tools and a broad library of predefined materials enable the LPKF ProtoLaser H4 to be operated with almost no user intervention.

- Quick surface processing on all common circuit board materials
- Exact geometries thanks to contactless, scanner-based process
- Precise drilling of even thick substrates with spiral drills as small as 0.2 mm in diameter
- Compact and safe tabletop system: lab-ready, class 1 laser
- Easy operation using intelligent, intuitive system software LPKF CircuitPro RP

LPKF ProtoLaser H4 (Part no.: 10116162)

Max. layout area and material size (X/Y/Z)	310 mm x 230 mm x 8 mm (12.2” x 9.1” x 0.3”)
Laser wavelength, frequency, max. laser power	1064 nm, 25 – 400 kHz, 20 W
Diameter of focused laser beam	25 ± 2 µm (1 ± 0.08 mil)
Structuring speed	14 cm^2/min (2.17 in^2/min)[a] on laminated substrates 18 µm (0.5 oz) Cu
Minimum line/space	100 µm / 30 µm (3.94 mil / 1.18 mil)[a] on FR4 18 µm (0.5 oz) Cu
Scanner resolution, repeatability in the scan field	1 µm (0.04 mil), ± 1.8 µm (± 0.07 mil)
Positioning accuracy in the scan field	± 10 µm (± 0.39 mil)
Milling spindle max speed, tool positions	100 000 RPM, 14
Tool sensor accuracy	± 5 µm
Dimensions (W x H x D), weight	725 mm x 665 mm x 840 mm (28.6” x 26.2” x 33.1”), 125 kg (275 lbs)
Power supply	115 – 230 V, 50 – 60 Hz, 500 W
Compressed air supply	Min. 5 bar; 50 l/min (min. 73 PSI; 50 l/min)
Ambient temperature; humidity	22 °C ± 2 °C (71.6 °F ± 4 °F); < 60 %
Software (starting on p. 21)	LPKF CircuitPro RP Basic
Laser safety	Laser Class 1
Options and accessories (starting on p. 25)	LPKF CircuitPro RP Advanced or Premium, dust extraction unit, compressor, starter set

[a] Depending on material and laser beam parameters

Technical specifications subject to change.

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LPKF ProtoLaser S4 – Laser Processing of PCBs

With the LPKF ProtoLaser S4, only a couple of minutes are needed from the layout to a structured circuit board – with exact geometries and drill holes for through-hole plating or cutouts. ProtoLaser S4 uses a laser source (532 nm, green) that, despite its high cutting capacity for copper, places hardly any stress on the substrate. Therefore, this lab laser can also safely process copper surfaces with inhomogeneities of up to 6 µm and is also suitable for the production of galvanic through-hole plating circuit boards as well as multilayer components. Fast processing, a wide choice of materials, safe process results in the lab!

ProtoLaser S4 is a solution for efficient prototyping of complex digital and analogue circuits, RF and microwave circuit boards with a size of up to 305 mm x 229 mm (12” x 9”). It is ideal for the production of single- or double-sided circuit boards, antennas, filters, and numerous applications featuring precise, steep flanks. In addition, it provides exact geometries on technical ceramic materials.

This laser system features the Advanced version of the LPKF CircuitPro software, which boasts various handy extras in addition to the necessary features (see page 21).

- Surface processing, suitable for the circuit, precise full section cuts and drill holes
- Compact and safe: lab-ready
- Optimized for circuit board materials from the electroplating process
- Prototyping and on-demand processing of custom small batches

LPKF ProtoLaser S4 (Part no.: 10055359)	
Max. layout area (X/Y/Z)	305 mm x 229 mm x 7 mm (12” x 9” x 0.28”)
Max. material size (X/Y/Z)	315 mm x 239 mm x 10 mm (12.4” x 9.4” x 0.39”)
Laser wavelength	532 nm
Max. laser power	12 W
Laser pulse frequency	25 – 300 kHz
Diameter of focused laser beam	20 ± 2 µm (0.78 ± 0.08 mil)
Structuring speed	12 cm^2/min (1.9 in^2/min)[a] on laminated substrates 18 µm (0.5 oz) Cu
Minimum line/space	75 µm / 25 µm (2.9 mil / 0.9 mil)[a] on FR4 18 µm (0.5 oz) Cu
Positioning accuracy in the scan field	± 10 µm (± 0.39 mil)
Repeatability in the scan field	± 2.2 µm (± 0.09 mil)
Dimensions (W x H x D)	910 mm x 1650 mm x 795 mm (35.8” x 64.9” x 31.3”)[b]
Weight	350 kg (772 lbs)
Power supply	110 – 230 V, 50 – 60 Hz, 1.5 kW
Compressed air supply	Min. 6 bar; 185 l/min (min. 87 PSI; 185 l/min)
Cooling	Air-cooled (internal cooling cycle)
Ambient temperature; humidity	22 °C ± 2 °C (71.6 °F ± 4 °F); < 60 %
Software (starting on p. 21)	LPKF CircuitPro Advanced
Options and accessories (starting on p. 25)	Dust extraction unit, compressor, starter set

[a] Depending on material and laser beam parameters

[b] Height with open hood: 1765 mm (69.5”)

Technical specifications subject to change.

www.lpkf.com/protolaser-s4

LPKF ProtoLaser U4 – Multipurpose Tool for the Electronics Lab

One System, Multiple Applications

The LPKF ProtoLaser U4 with integrated UV laser is capable of processing a wide variety of materials. It is easy to install and even easier to use. The high pulse energy of the UV laser leads to a residue-free ablation process, resulting in geometrically precise contours.

The LPKF ProtoLaser U4 can structure or cut diverse materials quickly and cleanly. The laser wavelength used makes the UV laser a truly multifunctional tool. A UV laser beam can cut individual boards out of large boards with high precision and no stress, drill holes and microvias, and create openings in solder masks. It can cut and structure LTCCs, fired ceramics, ITO/TCO substrates, delicate prepregs, and laminated materials like FR4- or RF-specific substrates.

The processing of various materials is supported by the CircuitPro Advanced software. An extensive materials library supplies the laser parameters for key materials. Because the ProtoLaser U4 works without material contact, tooling costs are a thing of the past. Micro material processing thus benefits from the fine laser beam diameter, the extremely precise focusing along the Z-axis, and the exact control of the processing positions.

- Excellent quality and high material variety due to the UV laser wavelength
- Laser-stabilized in the low energy area for the processing of thin and sensible materials
- Power measurement on the substrate level for process control
- Compact and safe: lab-ready

LPKF ProtoLaser U4 (Part no.: 10055358)	
Max. layout area (X/Y/Z)	305 mm x 229 mm x 7 mm (12” x 9” x 0.28”)
Max. material size (X/Y/Z)	315 mm x 239 mm x 10 mm (12.4” x 9.4” x 0.39”)
Laser wavelength	355 nm
Max. laser power	5.7 W
Laser pulse frequency	25 – 300 kHz
Diameter of focused laser beam	20 ± 2 µm (0.78 ± 0.08 mil)
Structuring speed	5.5 cm^2/min (0.9 in^2/min)[a] on laminated substrates 18 µm (0.5 oz) Cu
Minimum line/space	50 µm / 20 µm (2.0 mil / 0.8 mil)[a] on FR4 18 µm (0.5 oz) Cu
Positioning accuracy in the scan field	± 10 µm (± 0.39 mil)
Repeatability in the scan field	± 2.2 µm (± 0.09 mil)
Dimensions (W x H x D)	910 mm x 1650 mm x 795 mm (35.8” x 64.9” x 31.3”)[b]
Weight	350 kg (772 lbs)
Power supply	110 – 230 V, 50 – 60 Hz, 1.5 kW
Compressed air supply	Min. 6 bar; 185 l/min (min. 87 PSI; 185 l/min)
Cooling	Air-cooled (internal cooling cycle)
Ambient temperature; humidity	22 °C ± 2 °C (71.6 °F ± 4 °F); < 60 %
Software (starting on p. 21)	LPKF CircuitPro Advanced
Options and accessories (starting on p. 25)	Dust extraction unit, compressor, starter set

[a] Depending on material and laser beam parameters

[b] Height with open hood: 1765 mm (69.5”)

Technical specifications subject to change.

www.lpkf.com/protolaser-u4

LPKF ProtoLaser R4 – Specialist for Material-friendly Processing

An important parameter for laser micro-processing is the pulse duration. The LPKF ProtoLaser R4 with picosecond-short laser pulses allows the high-precision structuring of sensitive substrates, as well as the cutting of hardened or fired substrates.

Laser Ablation with Virtually No Heat Input

The shorter the processing pulse, the lower the heat input into the adjacent material. With the picosecond laser, there is practically no heat transfer, the material vaporises directly.

Micro Material Processing at its Best

This thermal effect is important for the cutting and surface processing of temperature-sensitive materials. The laser offers very high pulse energy for cutting, for example, ceramic materials such as Al_2O_3 or GaN without discoloring them in the processing procedure. Due to the low heat input, no micro-cracks occur in the material.

The ProtoLaser R4 is also the perfect system for surface processing – such as ablating transparent thin films or removing metal layers from plastic foils. It achieves the targeted very stable laser input at low laser power. This allows standard FR4 and laminated RF materials to be processed just as well.

The high-precision hardware and integrated camera are supported by the easy-to-use LPKF CircuitPro software. This enables the user to implement projects involving demanding materials in their own laboratory within a very short time.

- Precision picosecond laser for innovative research
- Gentle processing of thermally sensitive materials
- Intuitive CAM software
- Ready-to-use laser class 1 lab system

LPKF ProtoLaser R4 (Part no.: 10099642)	
Max. layout area (X/Y/Z)	305 mm x 229 mm x 7 mm (12” x 9” x 0.28”)
Max. material size (X/Y/Z)	315 mm x 239 mm x 10 mm (12.4” x 9.4” x 0.39”)
Laser wavelength	515 nm
Max. laser power	8 W
Laser pulse frequency	50 – 500 kHz
Diameter of focused laser beam	15 ± 2 µm (0.59 ± 0.08 mil)
Structuring speed	5.5 cm^2/min (0.9 in^2/min)[a] on laminated substrates 18 µm (0.5 oz) Cu
Laser pulse length	< 2 ps
Minimum line/space	35 µm / 20 µm (1.38 mil / 0.79 mil)[a] on FR4 18 µm (0.5 oz) Cu
Positioning accuracy in the scan field	± 8 µm (± 0.3 mil)
Repeatability in the scan field	± 0.23 µm (± 0.009 mil)
Dimensions (W x H x D)	910 mm x 1650 mm x 795 mm (35.8” x 64.9” x 31.3”)[b]
Weight	390 kg (860 lbs)
Power supply	110 – 230 V, 50 – 60 Hz, 2 kW
Compressed air supply	Min. 6 bar; 128 l/min (min 87 PSI; 128 l/min)
Cooling	Air-cooled (internal cooling cycle)
Ambient temperature; humidity	22 °C ± 2 °C (71.6 °F ± 4 °F); < 60 %
Software (starting on p. 21)	LPKF CircuitPro Advanced
Options and accessories (starting on p. 25)	Dust extraction unit, compressor, starter set

[a] Depending on material and laser beam parameters

[b] Height with open hood: 1765 mm (69.5”)

Technical specifications subject to change.

www.lpkf.com/protolaser-r4