



LightFab

Data Sheet LightFab 3D Printer

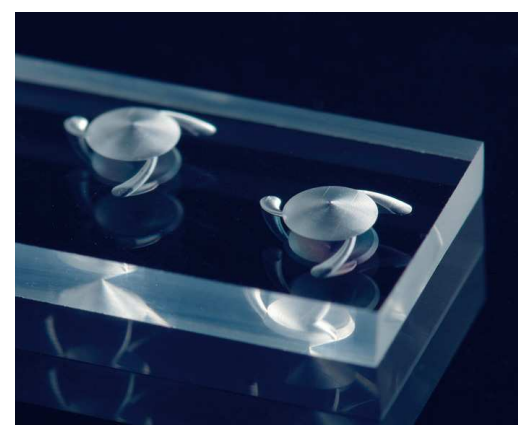
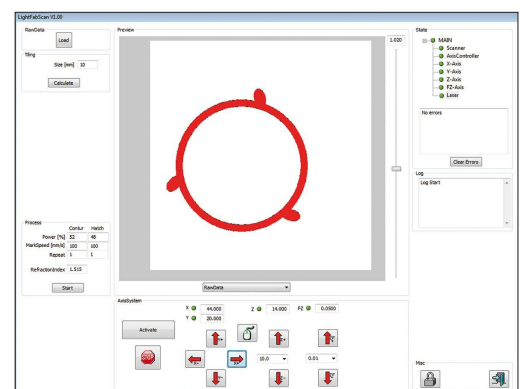
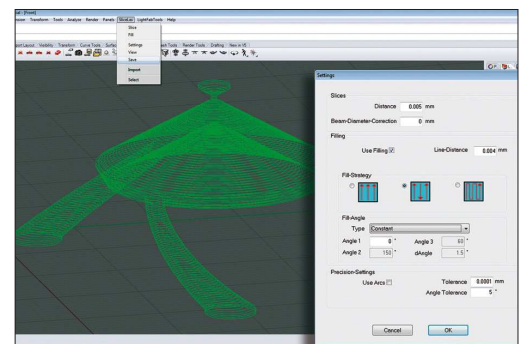
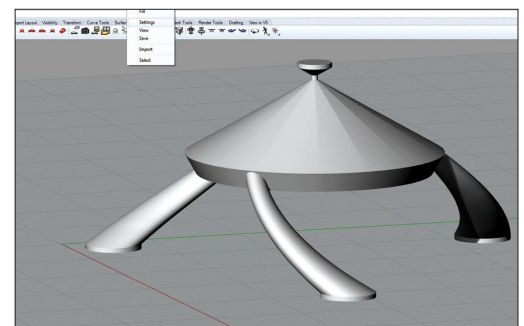
The LightFab 3D Printer is an extremely fast and precise table top machine for direct laser writing of transparent materials. The system can be used for applications such as micro fluidics, micro mechanics, integrated optics and other applications that require high precision, high resolution 3D microstructures. The LightFab 3D Printer is designed for fastest automatic 3D printing with the included CAD/CAM software. It is perfect for Direct Laser Writing processes such as multi photon polymerization of 3D polymer micro structures, 3D waveguide writing by ultrafast laser inscription, 3D lithography in glasses and crystals by selective laser-induced etching, internal welding of glass, and micro structuring by precision ablation with e.g. 1 μm focus diameter.

The LightFab 3D Printer includes a fast galvanometer scanner, a precision axis system, a fast and ultraprecise focusing module, the fs-laser, microscope objectives, microscope camera, and autofocus inside a table-top case. The included PC and the electronics are delivered in a separate electrical cabinet.

An arbitrary 3D structure is written layer by layer using the fast Microscanner module optimized for high precision and minimum positioning delays. If the structure is larger than the object field of the microscope lens, then the translation axes are used automatically to stitch the scanning fields. The repetition rate and the pulse duration of the fs-laser (either 4 W, 1030 nm or 2 W, 515 nm

wavelengths) are adjustable and allow the flexible optimization of the processing conditions for your processes and materials.

To automatically produce 3D parts with the LightFab 3D Printer the laser track data is generated in the CAD software Rhino 3D by our plug-in SliceLas. You may easily tune the 3D geometry e.g. to compensate for process specific shrinkage or over-etching and you may use different processing parameters for contour and hatching. Furthermore, you may conveniently check the 3D scan job inside the CAD software and modify individual vectors or you may use our integrated process specific tools. For highest productivity you may use the CAD software in your office to generate the complex 3D scan jobs conveniently and export them in the well-proven sll-format or the new efficient slb-format. In the lab you may load both formats in the GUI machine software and execute the 3D scan-job automatically to save valuable laser beam time. The included machine driver LightFabScan is optimized for fastest execution of the scan job layer-by-layer controlling the components of the system with μs precision and maximum efficiency. For most efficient process development with the LightFab 3D printer you may use the included GUI software Scan2D for quick drawing/writing and you may use the integrated powerful script language for automatic variation of most important processing parameters.



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Technical Details LightFab 3D Printer

Software package

PC in electrical cabinet	Win 7
Automatic 3D printing	Rhino 3D CAD with SliceLas, LightFabScan
Fast process development	Scan2D with script language, JS_AxisHost, LaserControl

3D Microscanner

Microscope objective	100x, NA=1.4, f=1.6 mm	40x, NA=0.6, f=4 mm	20x, NA=0.4, f=8 mm
Scan range xy	140 x 140 μm^2	350 x 350 μm^2	700 x 700 μm^2
Travel range z	300 μm	> 300 μm	> 300 μm
Resolution xyz	5 nm	11 nm	22 nm
Repeatability xyz	10 nm	25 nm	50 nm
Max. writing speed xy	30 mm/s	80 mm/s	160 mm/s
Max. positioning speed xy	120 mm/s	300 mm/s	600 mm/s
Positioning time z	< 20 ms	< 20 ms	< 20 ms
Accessible volume (e.g. in glass)	120 x 80 x 0.3 mm^3	120 x 80 x 2 mm^3	120 x 80 x 7 mm^3

Linear stepping axes

Travel range xy	120 x 80 mm^2
Travel range z	25 mm
Resolution xy	50 nm
Resolution z	100 nm
Repeatability xy	150 nm
Repeatability z	1 μm
Max. positioning speed xy	300 mm/s
Max. positioning speed z	10 mm/s

Laser with modulator

Wavelength preset at factory

Wavelength	1030 nm	515 nm
Beam quality	1.3	1.3
Max. power	4 W	2 W
Max. pulse energy	4 μJ	2 μJ
Repetition rate adjustable	100 kHz – 10 MHz	
Pulse duration adjustable	400 fs – 5 ps	
Laser power automatic control	0 – 100 %	

Options and Accessories

Laser parameters factory set e.g. for SLE of fused silica or for 2PP of polymers

Universal sample holder or sample holder for 4 slides 75 x 25 mm^2

Adapters for various microscope objectives

Motorized control of linear polarization 0-360°, circular polarization

Vibrational isolated table and laminar flow box with yellow light