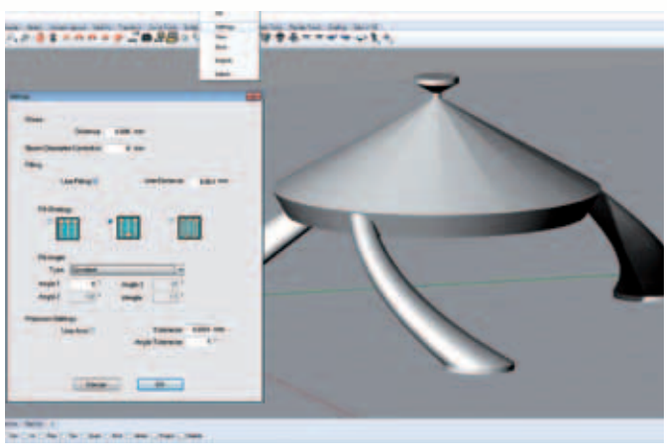
LightFab
3D Printer

Data Sheet LightFab 3D Printer

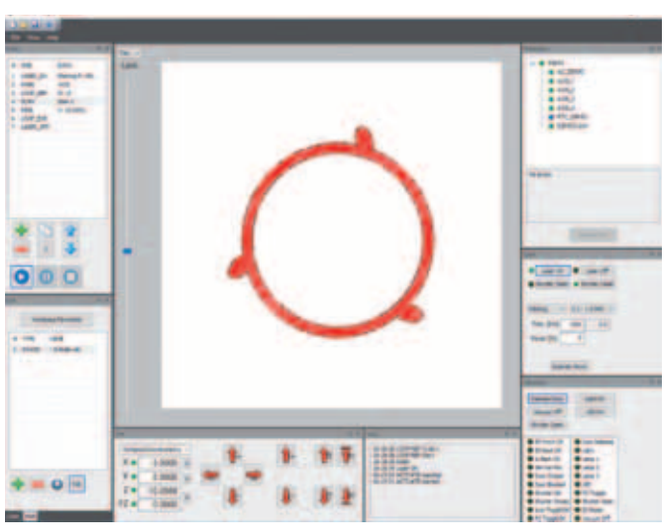
The LightFab 3D Printer is a full grown extremely fast and precise machine to produce 3D glass microsystems by internal modification. Ultrashort pulsed laser radiation is focused tightly inside the transparent material and the massless focus is moved fast by the LightFab 3D Microscanner in the machine. Microstructures larger than the fast scanning field are enabled by 3 additional high precision axes (scientific version: 120x80x35mm^3, manufacturing version: 200x200x150mm^3). Automatic precision alignment is possible with coaxial micro vision system and detection software.
Thus the LightFab 3D Printer is especially useful for mask-less writing processes with micro/nano focus inside glasses or other transparent materials:

- SLE: 3D lithography through selective laser etching of glasses or crystals, see our datasheet for SLE production service
- 2-photon polymerization: 3D lithography of photosensitive materials
- 3D waveguide writing by refractive index change
- 3D laser inscription: Crack-free markings inside glasses
- Laser ablation from the backside of the material
- Glass welding at internal interfaces



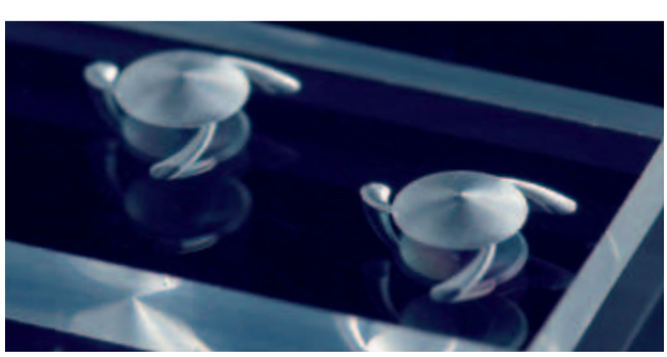
CAD

The included CAD software allows to import various 3D formats (step, iges, …) and is extended with the LightFab 3D printer driver for easy generation of very complex print jobs e.g. with adaptive slicing, variable fillings and smooth curved contours. With the machine software LightFabScan the print jobs are executed automatically using scripts with flexible control of all processing parameters.



Machine

Subtractive 3D printing of precision quartz glass parts is not only a niche market for prototypes anymore. We have already demonstrated the scaling of the SLE-process to enable mass-production: With our high speed scanning modules and high power fs/ps-lasers we turn our flexible LightFab 3D Printer into a dedicated mass-production tool with boosted productivity in the range of 10-100x.



3D nozzle

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LightFab

Technical Details LightFab 3D Printer

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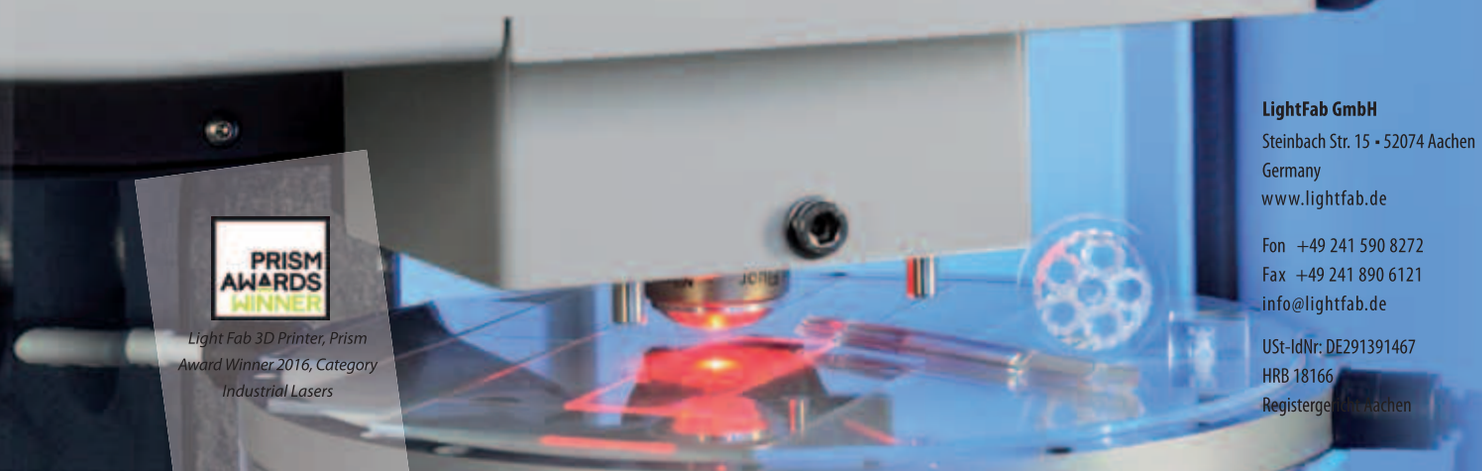
General	
System configuration	3 scanning axes, 3 precision axes, fs-laser, control PC
Software	CAD Rhino 5 with LightFab 3D printer driver,
	machine software LightFabScan & vision system
Laser safety	Class 1 according to EN 60825-1:2014 (class 4 during maintenance)
Vibration isolation	Self leveling pneumatic isolation
Size	142 x 120 x 196 cm^3 plus swiveling console

3D Microscanner	**oil immersion**	**air**
Microscope objective	60x, NA=1.4, f= 3,2 mm	20x, NA=0.4, f=10 mm
Scan range xy	220 x 220 μm^2	700 x 700 μm^2
Travel range z	300 µm	> 300 µm
Repeatability xyz	20 nm	50 nm
Max. writing speed xy	60 mm/s	200 mm/s
Max. positioning speed xy	240 mm/s	750 mm/s
Accessible depth (e.g. in glass)	0.3 mm	5 or 7 mm

Linear stepping axes	**Scientific**	**Manufacturing**
Travel range xy	120 x 80 mm^2	200 x 200 mm^2
Travel range z	35 mm	150 mm
Repeatability xy	150 nm	150 nm
Repeatability z	1 µm	500 nm
Max. positioning speed xy	200 mm/s	400 mm/s
Max. positioning speed z	10 mm/s	30 mm/s

Laser with modulator	**Wavelength preset at factory**	
Wavelength	1030 nm	515 nm
Max. power	4 W	2 W
Max. pulse energy	4 µJ	2 µJ
Beam quality	1,3	
Repetition rate adjustable	100 kHz – 10 MHz	
Pulse duration adjustable	400 fs – 5 ps	
Laser power automatic control	0 – 100 %	



Light Fab 3D Printer, Prism Award Winner 2016, Category Industrial Lasers

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