HEIDELBERG INSTRUMENTS

MPO 100

3D LITHOGRAPHY AND 3D MICROPRINTING

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MPO 100

The MPO 100 is a Two-Photon Polymerization (TPP) multi-user tool for 3D Lithography and 3D Microprinting of microstructures with applications in Optics, Photonics, Mechanics, and Biomedical Engineering. The modular 3D printing platform MPO 100 offers high precision on demand for 3D Lithography as well as high print volume for 3D Microprinting and enables production of complex functional microstructures with high throughput in a single process step.

MPO 100 HIGHLIGHTS: 1 - 10 - 100 - 1000

- Printing height of over 1 cm
- Surface quality: Roughness down to 10 nm
- Minimum feature size down to 100 nm
- Scan speeds over 1000 mm/s
- Flowbox with temperature control down to ± 0.1 °C
- Print area of 100 mm x 100 mm
- Stitching-free fabrication capability
- Additive processing of organic and hybrid polymers (ORMOCER®s)
- Subtractive processing of metal layers (Au, Ag, Cr, …)

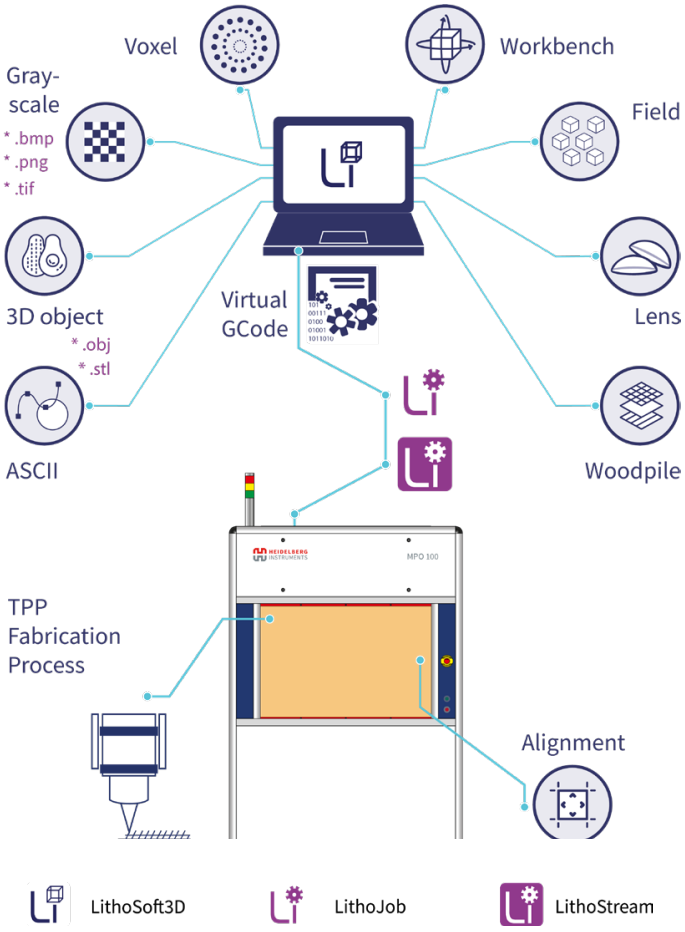
The MPO 100 includes the following parts:

Software: The software package (LithoSoft3D, LithoJob, LithoStream) enables different user experience levels from beginners to experts.

Lithography Unit: 522 nm fs laser and a scanning system including XYZ air-bearing stages synchronized with the galvoscanner.

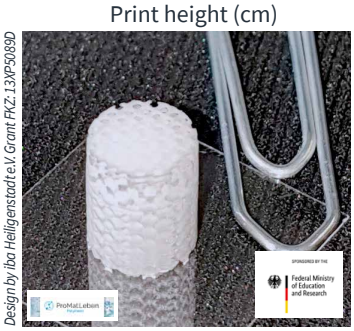
Write Mode: Calibrated microscope objectives (both immersion and air) are magnetically mounted and enable fast switching. Fabrication process can be monitored via top or bottom illumination.

Sample Holder: Varying sample holders can be mounted magnetically to the XY translation stage.



The MPO 100 includes the software package LithoSoft3D and LithoStream with various options for advanced 3D nano-, micro-, and macro-processes.

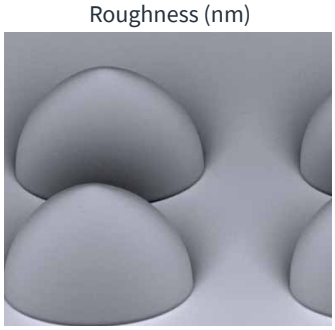
1
Print height (cm)



Design by Ibo Heiligenstadt e.V. Grant FKZ: 13XP5089D

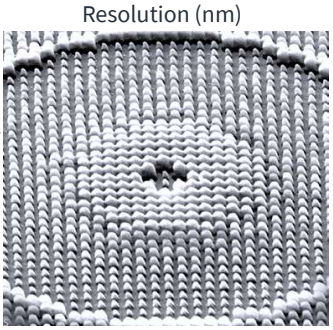
3D scaffold structures for biomedical applications such as implants in regenerative medicine.

10
Roughness (nm)



High quality microoptical elements with varying shapes (e.g. freeform) and sizes can be fabricated either on planar substrates or directly on active/passive devices.

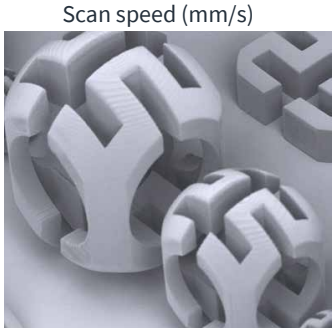
100
Resolution (nm)



PHENOmenon, EU-funded project GA 780278

Metastructures with feature sizes below the diffraction limit can be fabricated in a single process step.

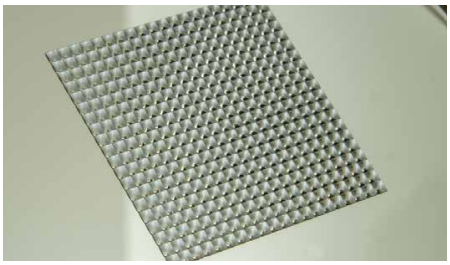
1000
Scan speed (mm/s)



3D structures for diverse applications such as optics, mechanics, and life science can be fabricated at high speed.

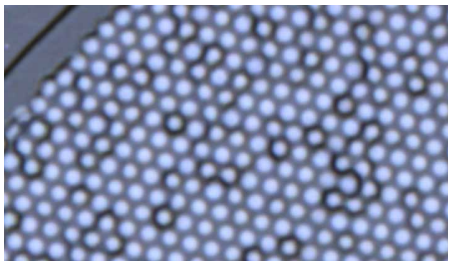
ADVANTAGES

OPTICAL MATERIAL



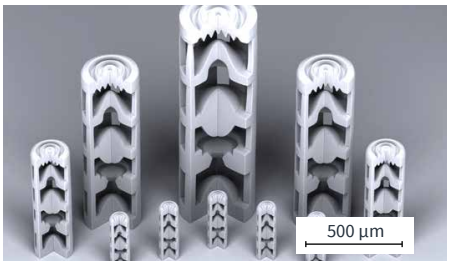
20 mm x 20 mm microlens array (MLA) with a filling factor of 100% consisting of 400 rectangular microlenses with dimensions of 1 mm x 1mm x 0,1 mm.

PRINTING ON DEVICES



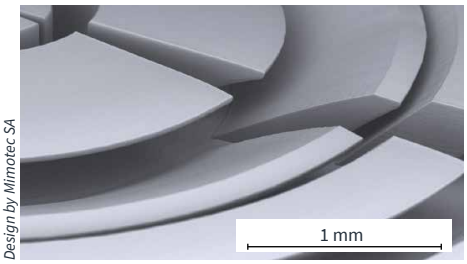
Endoscopy: DOE printed on a multifiber bundle to compensate the phase delay of the different fiber cores.

COMPLEXITY



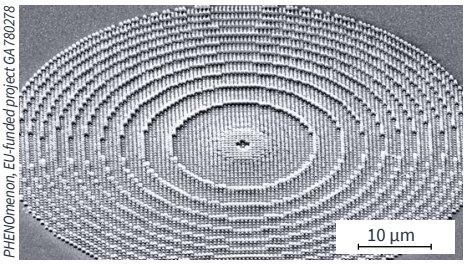
Lens stacks in different sizes, i.e. for biomedical applications/endoscopy.

RESOLUTION



Design by Mimotec SA

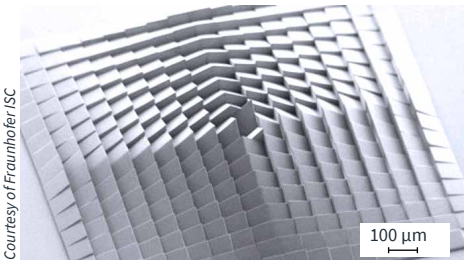
Mold (diameter 10 mm) with non-vertical sidewalls for micromechanical application. The mold was fabricated stitching-free using the IFoV Mode in combination with railroad hatching.



PHENOmenon, EU-funded project GA 780278

Metalens for visible light with smallest feature sizes in the range of 100 nm.

REPLICATION

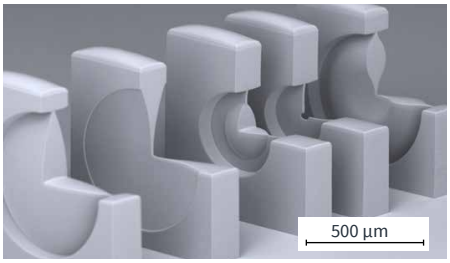


Courtesy of Fraunhofer ISC

Microprism Array with varying angles in XY.

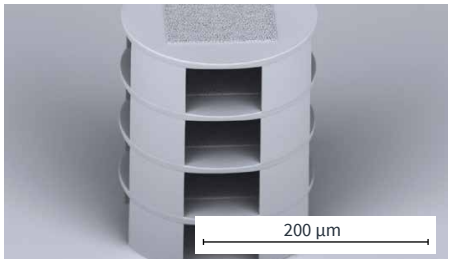
APPLICATIONS

REFRACTIVE OPTICS



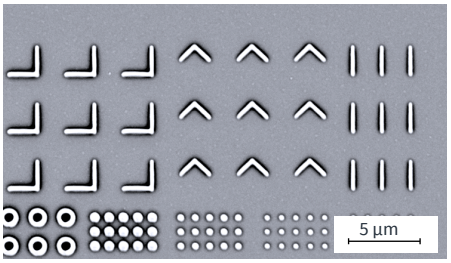
Horizontal lens system: Entire optical systems can be fabricated in a single process step without the need for alignment.

DIFFRACTIVE OPTICS



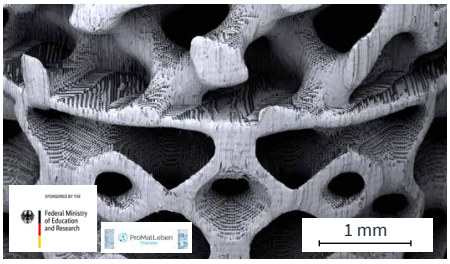
Stacked multilayer DOE structure with a pixel size of 550 nm x 550 nm.

META-STRUCTURES



Typical metastructures additively fabricated.

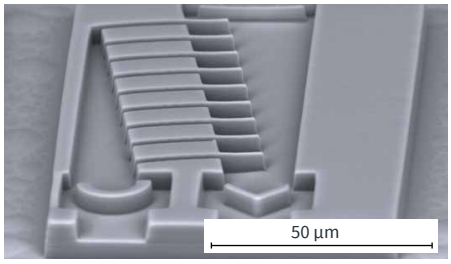
BIO-MEDICAL ENGINEERING



Design by iba Heiligenstadt e.V.
Grant FKZ: 13XP5089D

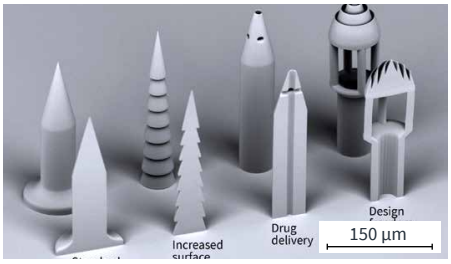
Bone-cartilage scaffold: 3D scaffold structures with micro- and macroporosity for bone cartilage implants.

MICROFLUIDICS



Microfluidic reactor: Microfluidic structures with high complexity and with tunable channel width.

MICRO-NEEDLES



Micro-needles with different designs and functionalities.

MPO 100

SYSTEM SPECIFICATIONS

Performance				
Print height (max.)	≥ 1 cm			
Roughness (min.)	≤ 10 nm			
Minimum feature size (min.)	≤ 100 nm (lateral)			
Scan speed (max.)	10 m/s divided by magnification (e.g. 1000 mm/s for 10x)			
Materials (additive or subtractive)	ORMOCER®s, customer-specific resins, AZ-series, ma-P 1200, metal layers (e.g. Ag, Au, Cr, ...)			
Fabrication modes	Galvo Mode: Scan-and-Step Exposure with galvo (stitching) Stage Mode: Moving the sample via stage (enabling stitching-free) IFoV Mode: Synchronized exposure of stage and galvo (enabling stitching-free)			
Scan Strategy	Conventional layer-by-layer fabrication Voxel Tuning with intensity variation during hatching			
Laser	λ = (522 ± 3) nm	τ_{pulse} ≤ 250 fs	f_{rep} = (63 ± 0.6) MHz	P_{mean} ≥ 600 mW
Laser power at focusing optics (max.)	≥ 200 mW			
Focusing optics	Numerical aperture: 0.2 (air) to 1.4 (immersion) Magnification: 5x to 100x Field-of-View (FoV): up to 2 mm			
Print area	100 mm x 100 mm			
Autofocus	Optical detection of interfaces down to 20 nm			
Substrate	Size: up to 8", Thickness: up to 4 cm			
Software	LithoSoft3D (code generation software) LithoJob and LithoStream (system control software)			
Translation axis	Electromagnetic direct drive, air bearing Accuracy: ± 0.2 µm per axis (over full travel range) Repeatability: down to ± 0.05 µm per axis (over full travel range) Synchronization with galvoscanner			
Temperature controlled flowbox	Control down to ± 0.1 °C, ISO Class 4 cleanroom environment			
System dimensions (TPP unit)				
Footprint	1300 mm x 1100 mm x 2160 mm			
Weight	< 1000 kg			
Installation requirements				
Electrical	115/230 V, 50/60 Hz, 16 A			
Optimum lab conditions	Temperature: 21 °C ± 1 °C	Humidity: 40 – 80 % non-condensing		
Compressed air	6 – 8 bar, stability ± 0.5 bar			
Room lighting	Yellow light			

Please note: Specifications depend on individual process conditions and may vary according to equipment configuration. Scan speed depends on Write Mode. Design and specifications are subject to change without prior notice.

Visit product website for more information

To contact your local representative, please consult our website *heidelberg-instruments.com*

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HIMT V7.2 | 08 / 23