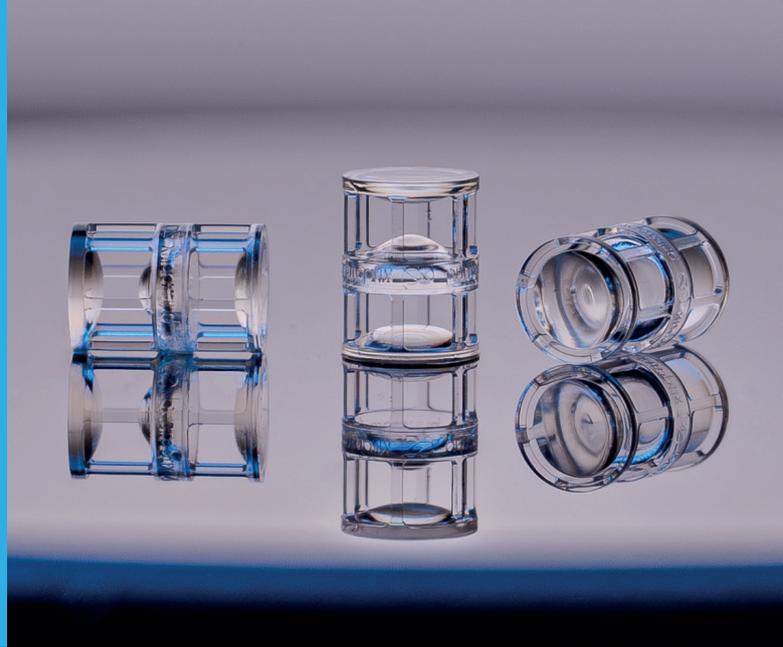




printoptix

# Micro Objective Lenses

Custom all-aspheric objectives in the smallest possible form factors



## Perfectly aligned all-freeform lens stacks

Our entirely new approach to lens fabrication allows for optical solutions that were previously unthinkable.

## Key Features



Size ranges from 100  $\mu\text{m}$  to 4 mm, very short variants possible.



Freeform surfaces that are inherently alignment free. Field of view range:  $10^\circ$  -  $160^\circ$ .



Surface roughness  $< 10$  nm RMS.  
Shape errors  $< \text{diameter}/1000$  PTV.

## Examples:

- Wide angle objectives
- Distortion free objectives
- Tilted-viewed angle lenses
- Micro tele lenses
- Lenses with integrated sensor sleeves
- Integrated apertures



Direct integration of black apertures and baffles, custom geometry adaptations.



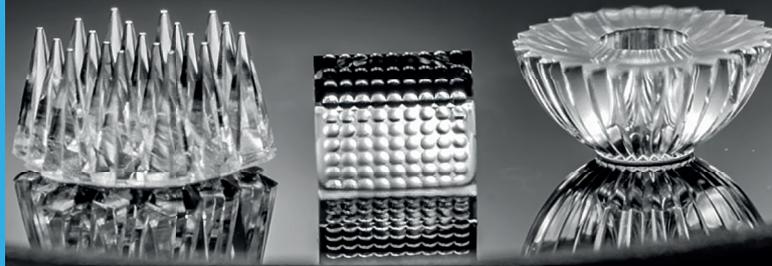
Biocompatible polymers that are longterm stable, autoclavable and highly transparent



Printing on sensors with  $< 1$   $\mu\text{m}$  alignment precision in x, y and z.

# Micro-Optical Components

Micro-optical elements with arbitrary shape and size



## Highly individualized parts

3D-Printing of micro-optical components allows for highly unusual and complex optics that open up entirely new applications.

## Examples:

- Lenses
- Prisms
- Diffractive parts
- TIR lenses
- Lensed prisms
- Fresnel lenses
- Hybrid components

## Key Features



Size Range from 20  $\mu\text{m}$  to 4.5 mm.



Alignment-free integration of absorbing structures.



Full freeform surfaces and designs with undercuts are possible.



Highly transparent print materials with low fluorescence.



Surface roughness < 10 nm RMS.  
Shape errors < diameter/1000 PTV.



Integration of mounting structures with no alignment errors.

# Optical Arrays & Mastering

Custom optical arrays with freeform shapes, high aspect ratios and 100% fill factor



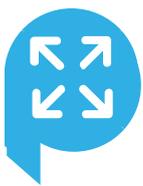
## Custom optical arrays

Fabrication by 3D-Printing allows for almost unlimited design freedom and multiple options for replication.

## Examples:

- Step & repeat scale-up
- Soft stamps
- UV nano-imprint lithography or roll-to-roll
- Hard stamps
- Electro-forming, hot embossing, roll-to-roll and micro injection molding
- Micro-displays
- Coupling optics
- Sensor arrays

## Key Features



Array lateral dimensions from  $< 100 \times 100 \mu\text{m}^2$  to 6" wafer size.



Element aspect ratios (height to diameter) of 10.



Lenses or unit cells sized from 3  $\mu\text{m}$  to 4 mm, fill factors up to 100%.



Freeform elements, variable pitch, undercuts, randomised structures.



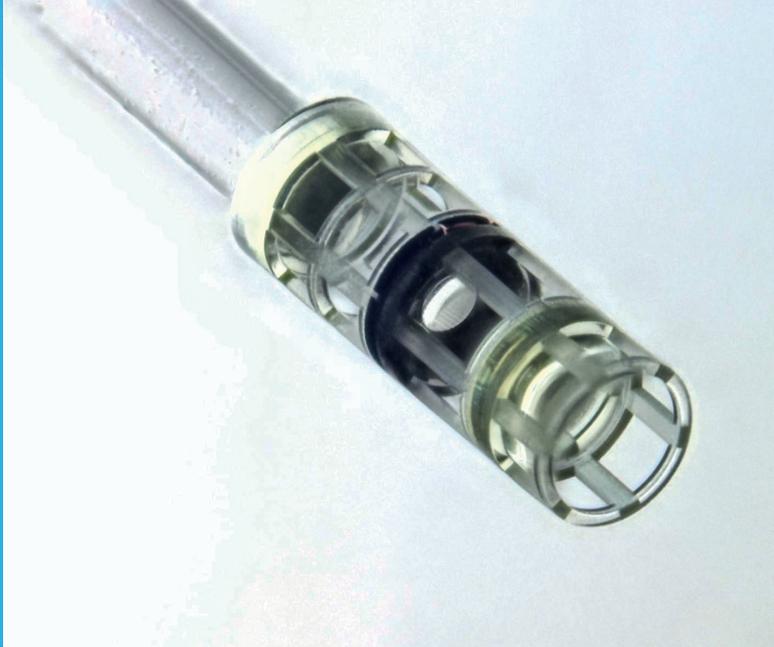
Surface roughness  $< 10 \text{ nm RMS}$ .  
Shape errors  $< \text{diameter}/1000$ .



Aligned printing with  $< 1 \mu\text{m}$  absolute precision in x, y and z.

# Fiber Tip Optics

Highly compact refractive, reflective, diffractive, and hybrid optical structures



## Powerful optical components, perfectly aligned to the fiber mode field

Our approach of direct fabrication on the fiber tips enables highly precise fiber optical systems.

## Examples:

- Lensed fibers
- OCT probes
- Fiber-To-PIC coupling lenses
- Mode matching lenses
- Beam shaping
- Chromatic fiber probes
- Objective lenses on fibers

## Key Features



Optical surface quality with feature sizes  $< 1 \mu\text{m}$ .



Custom integration of absorbing structures and encapsulation features.



Freeform segmented, or diffractive surfaces.



Direct integration of optics into common fiber connectors.



Surface roughness  $< 10 \text{ nm RMS}$ .  
Shape errors  $< \text{diameter}/1000 \text{ PTV}$ .



Direct alignment to fiber mode field with  $< 1 \mu\text{m}$  precision.



