



# **LASER EQUIPMENT FOR MICROPROCESSING**

## **Appolo Workshop**

**Thomas Bewer  
Head of Advanced Development**

**Burgdorf, 04.11.2015**

# Laser application lab in Baar

**Service:**

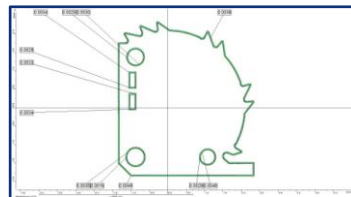
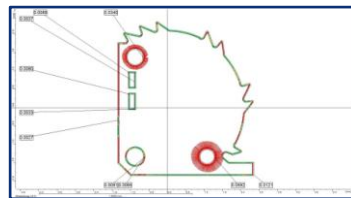
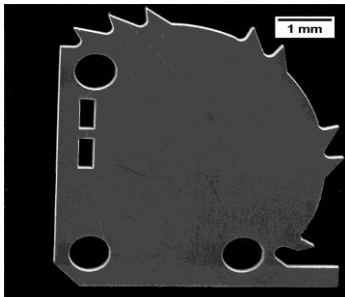
Supporting the development of your USP laser application at Baar

- Different laser work stations with pico and femto second lasers available.
- Inspection of part quality with high precision measurement systems possible.



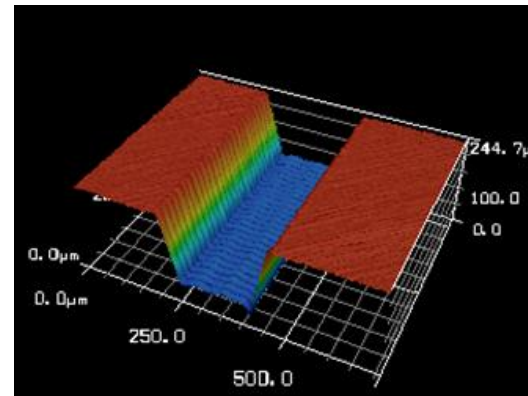
**DXF assisted contour inspection**

shown: tolerance  $\pm 2 \mu\text{m}$  (green within tolerance)



**3D Depth profile measurement**

incl. measurement of surface roughness

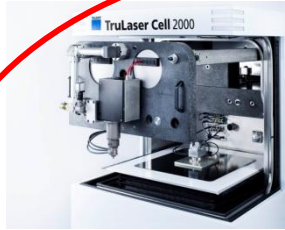


# TruLaser Cell 2000

## Flexible platform for micromachining



All from one source



Intelligent and patented change concept of the optic tray (<15min)

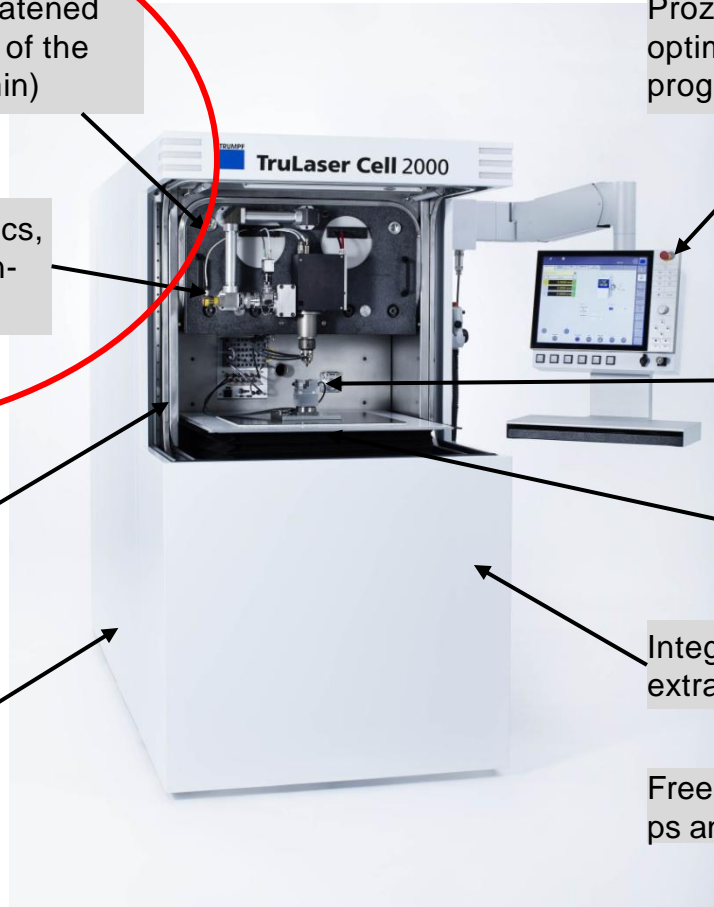


Free choice of optics, optional with vision-system



Isolated Prozess chamber

Granite construction for high precision



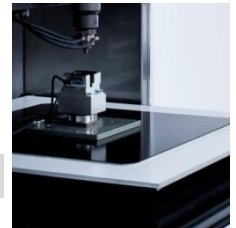
Prozess-orientated and -optimized controls and programming

Flexible workholder

High precision X-Y-Table

Integrated laser source and extraction system

Free choice of TRUMPFs ps and fs lasers

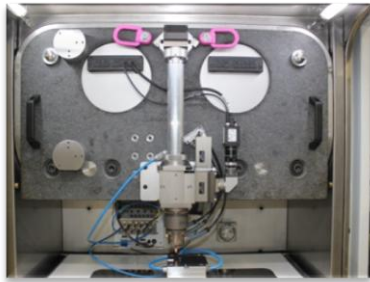


# Exchangable optic tray offers a broad choice of optics

Examples of possible configurations

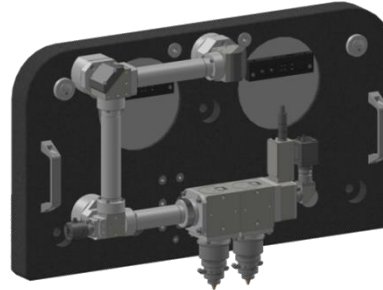


## Fixed optic



Ideal for fine cutting

## Parallel fixed optics\*

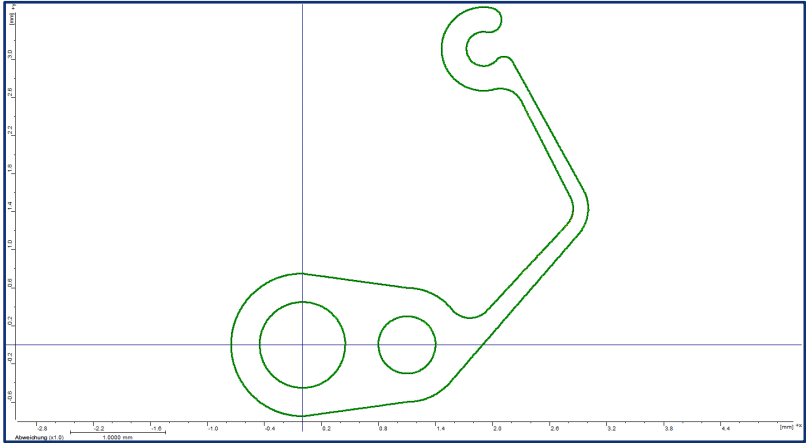
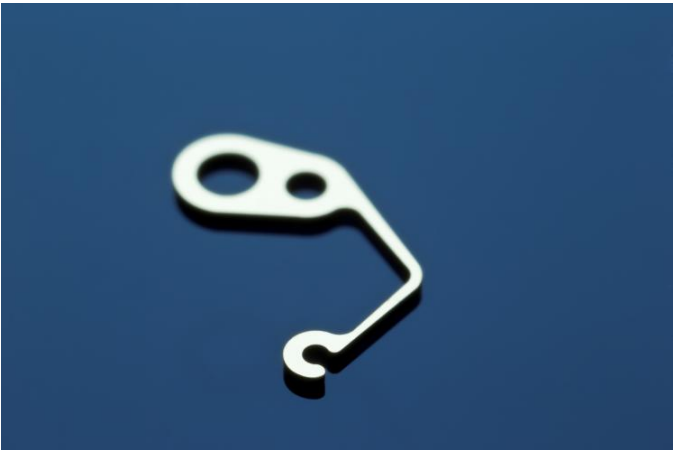
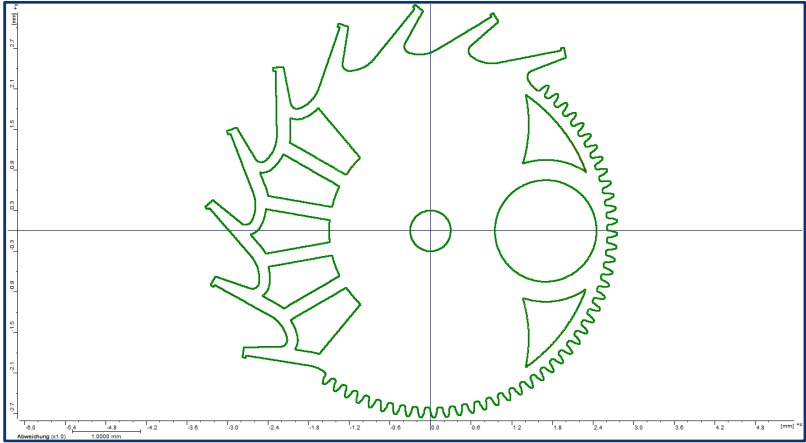


Ideal for parallel processing with fixed optics at higher laser power

\* schematic

# High precision cutting

xy table has an accuracy of  $\pm 1$  micron



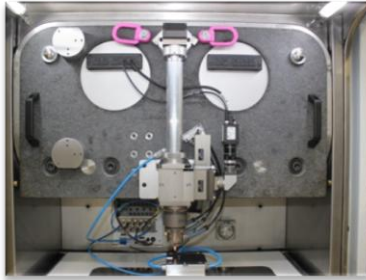
**Tolerance band  $\pm 2$  micron – green within tolerance**

# Exchangable optic tray offers a broad choice of optics

Examples of possible configurations

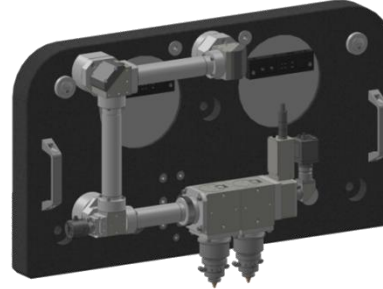


## Fixed optics



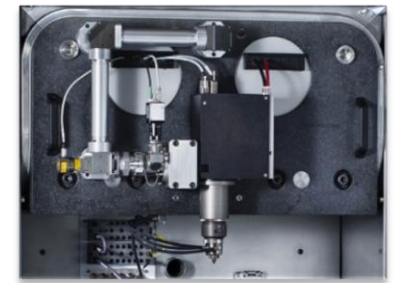
Ideal for fine cutting

## Parallel fixed optics\*



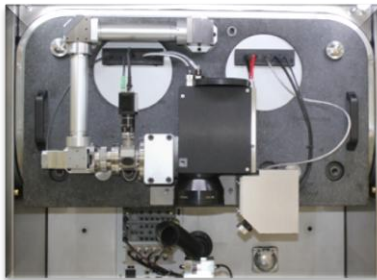
Ideal for parallel processing with fixed optics at higher laser power

## Scanner & fixed optics



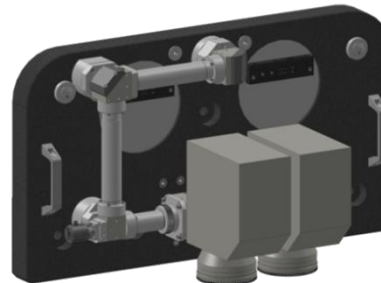
Ideal for fast change between scanner & fixed optics, Wobble-processes

## Scanner



Ideal for ablation processes, but also for cutting and drilling

## Parallel scanner\*



Ideal for parallel processing with scanner optics at higher laser power

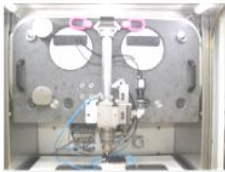
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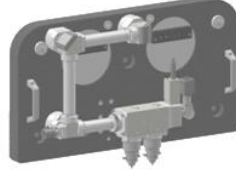


### Fixed optics



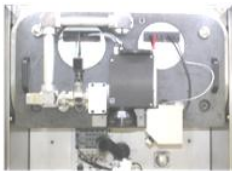
Ideal for fine cutting

### Parallel fixed optics



Ideal for parallel processing with fixed optics at higher laser power

### Scanner



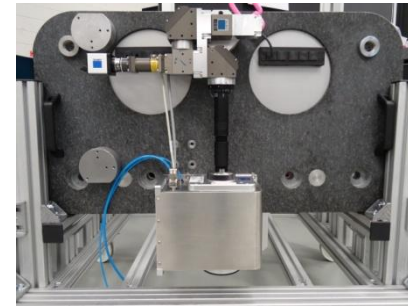
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### Parallel scanner



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### „Non Standard“ Optics Trepanning optic



For drilling and cutting with highest demands regarding taper angle

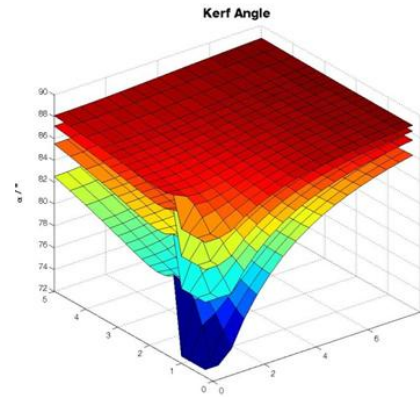
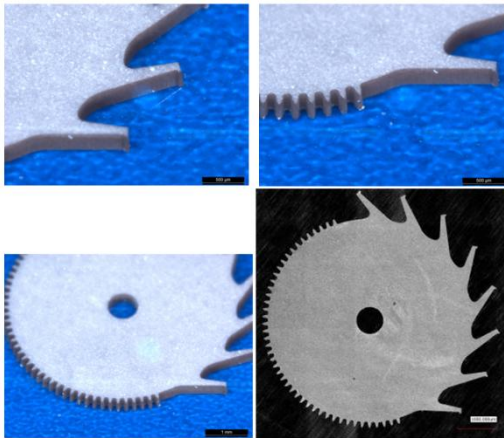
### Scanner & fixed optics



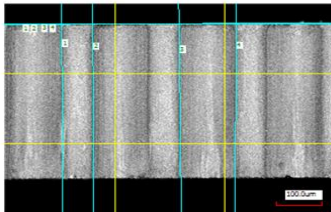
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# Trepanning optics

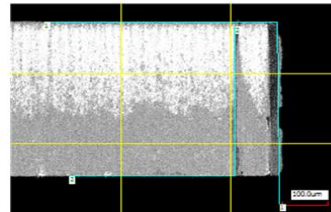
CTI Project BFH, CSEM and TRUMPF – Focus on brittle-rigid materials Sapphire, Si, Si<sub>3</sub>N<sub>4</sub>



Models were developed that can predict kerf angles and curf width

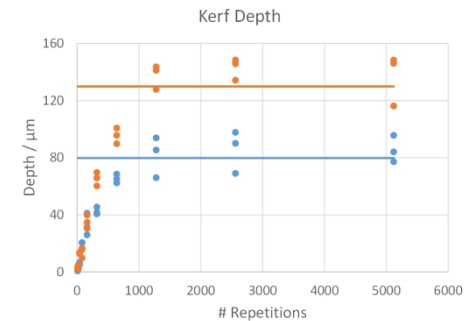


Winkel ca. 90.1°



Winkel ca. 90.4°

**Kerf angles of 90 ±0.4° were achieved**

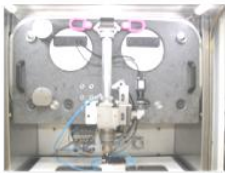




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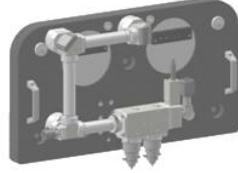
## Examples of possible configurations

Fixed optics



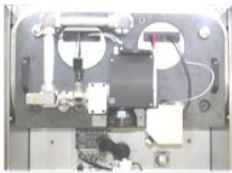
Ideal for fine cutting

Parallel fixed optics



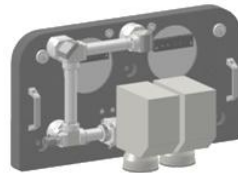
Ideal for parallel processing with fixed optics at higher laser power

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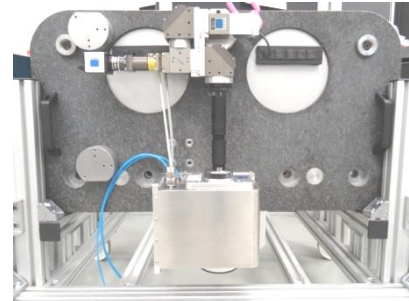
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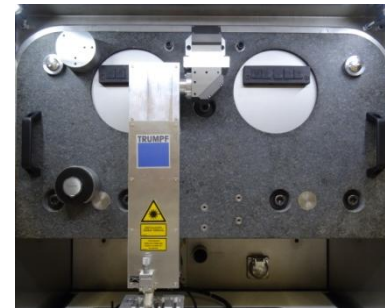
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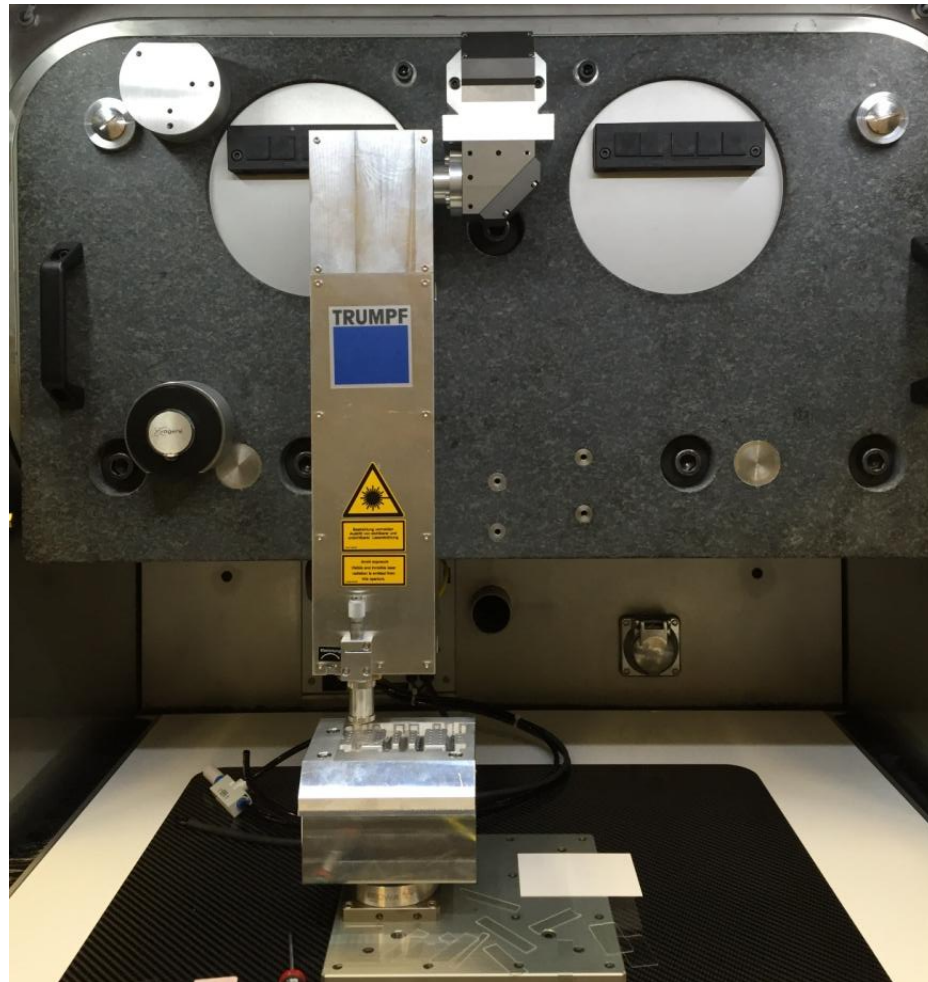
## Top Cleave optic



Fast cutting of transparent materials

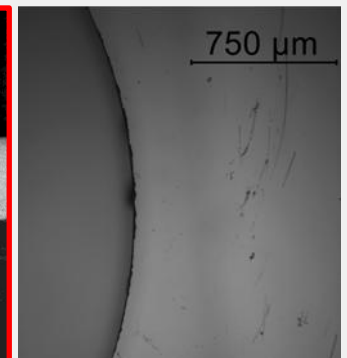
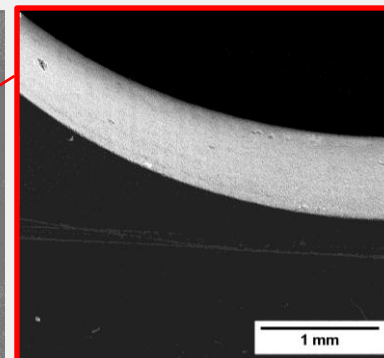
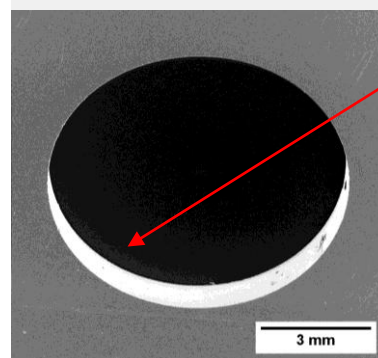
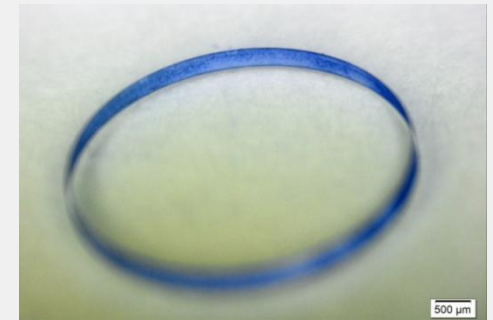
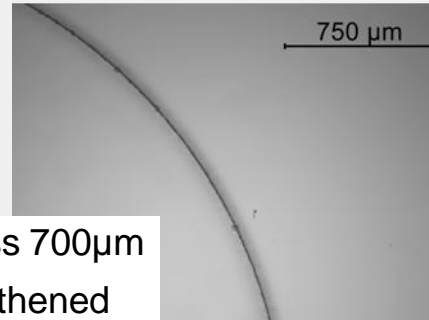
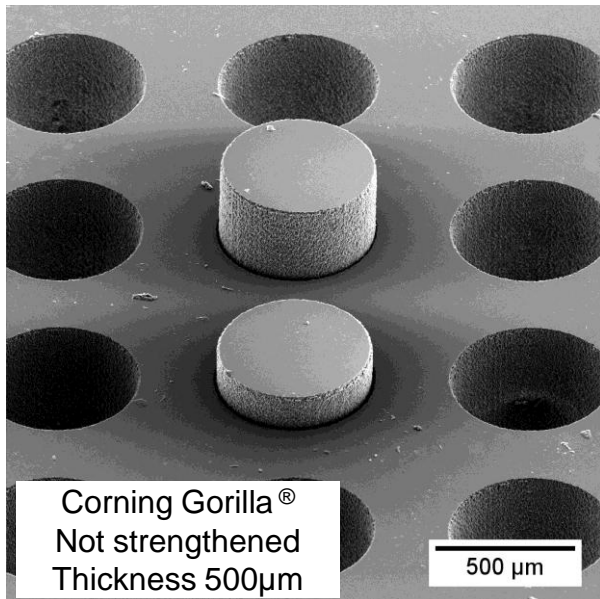
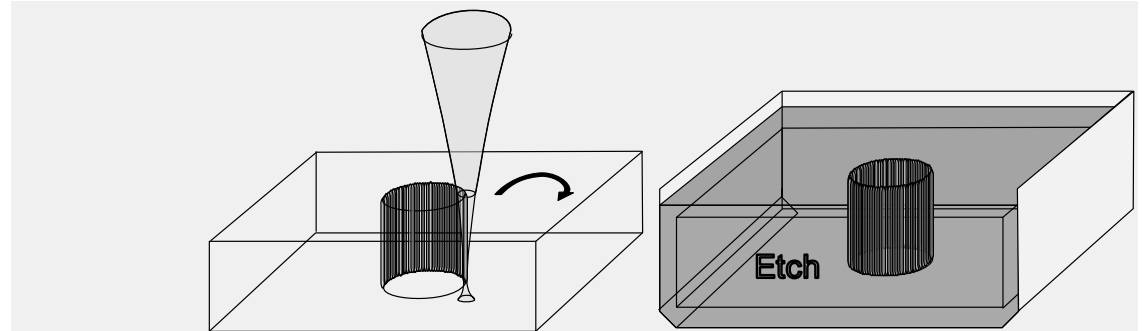
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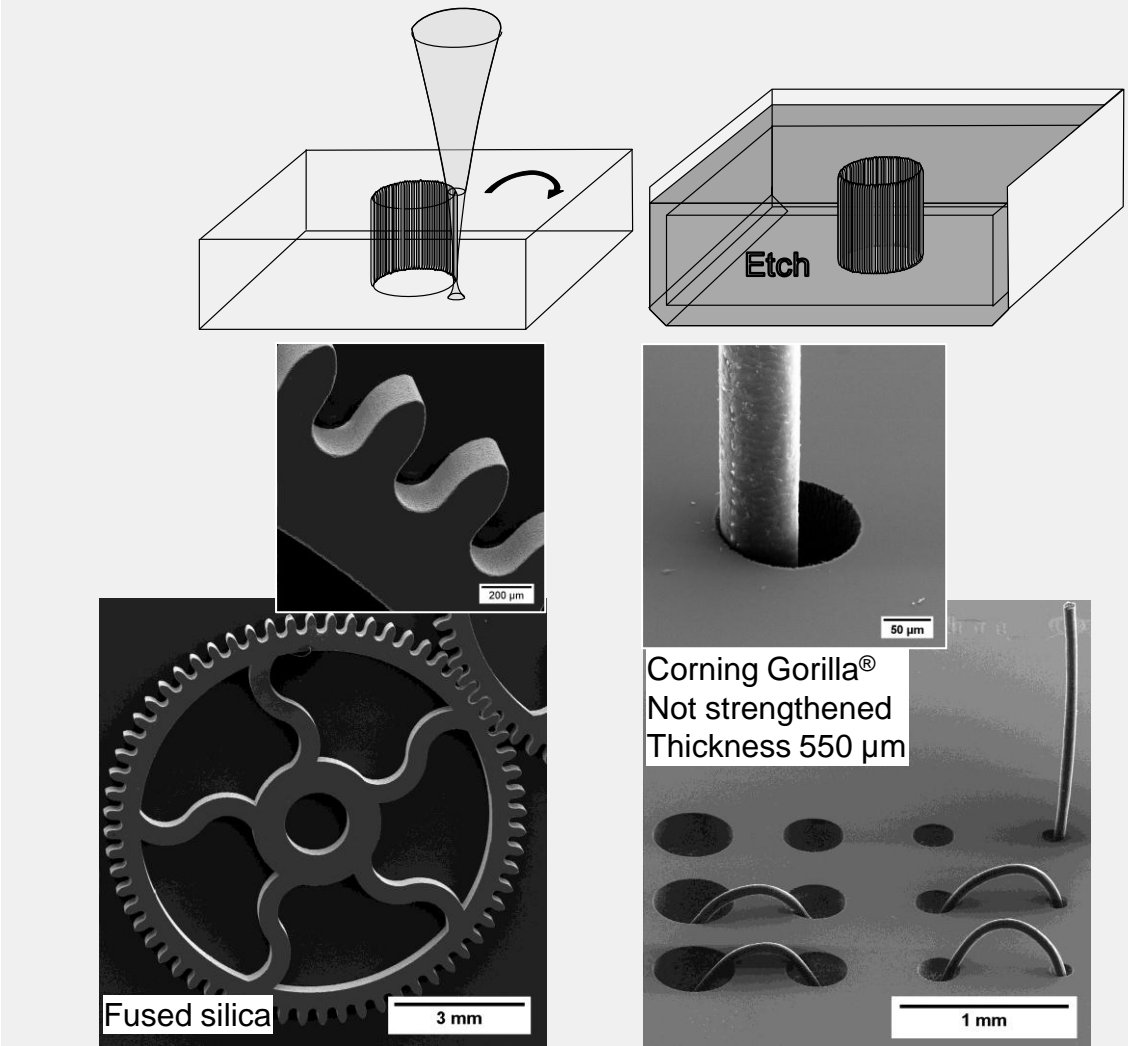
# Selective Laser Etching of Elongated Modifications

- Single pass modification by elongated beam shape
- Selective etching
- Separation
- Process benefits from beam shaping



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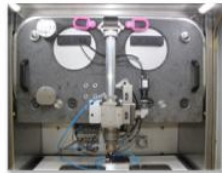


# TruLaser Cell 2000

Flexible platform for micromachining processes



### Fixed optics



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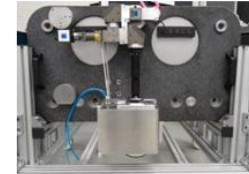
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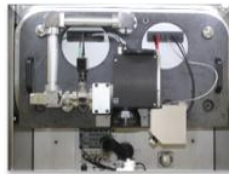
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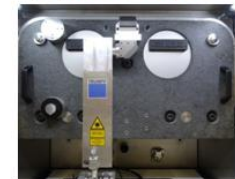
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more to come ...



# YOUR CONTACT

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