

Machining of transparent materials

Cutting, welding, drilling and engraving of transparent materials with minimization of mechanical stress



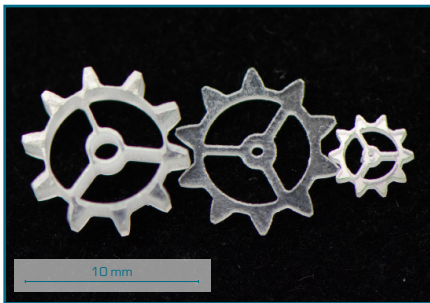
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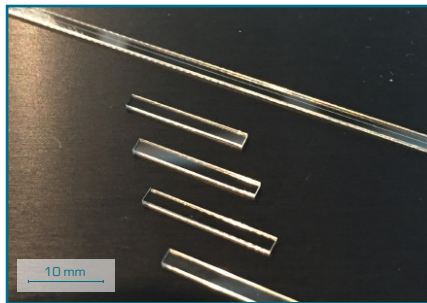
Machining of transparent materials

Cutting, welding, drilling and engraving of transparent materials with minimization of mechanical stress

Short or ultra-short pulse lasers allow transparent materials to be machined with or without removal of material and to modify their intra-volume physical properties.



Glass cutting



Glass cutting without material removal

MATERIALS

- Glass
- Crystals
- Transparent ceramics



BENEFITS

- Intra-volume machining: localized laser modification – long lasting effect - no need for additional organic layer
- Ablation-free cutting: dust-free - very fast - no taper
- Conventional cutting: fast - with controlled geometry



PERFORMANCE

- Intra-volume machining: up to 15 MPa of mechanical strength for some glasses, micrometric precision
- Conventional and ablation-free cutting: precision of a few μm
- Conventional cutting: aspect ratio up to 50



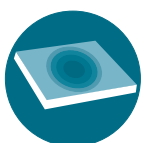
THROUGHPUT

- Ablation-free cutting: $> 100 \text{ mm.s}^{-1}$, can cut up to a thickness of 1 mm in a single pass
- Intra-volume machining: $< 100 \text{ mm.s}^{-1}$ for welding and a few hundred mm.s^{-1} for index modification
- Conventional cutting: up to a few tens of mm.s^{-1} of machining speed depending on the thickness



LASER WORKSTATION

- Intra-volume machining: large numerical aperture objective, scanning systems
- Ablation-free cutting: special beam shaping such as Bessel beam
- Conventional cutting: bottom-up approach through material volume



SURFACE CONDITION

- Ablation-free cutting: surface roughness less than 500 nm
- Conventional cutting: surface roughness less than $1 \mu\text{m}$



AREAS OF APPLICATION

- Watchmaking
- Optics
- Display
- Electronics