



EPIC Online Technology Meeting on Laser Glass Processing
4JET microtech GmbH, Dr. Marc Hüske

The 4JET Group – Innovative Laser Solutions for Tomorrow’s Production

- Headquartered in Alsdorf, Germany • Subsidiaries in Atlanta and Shanghai • 130 employees, incl. 45 R&D engineers
- Unique know-how in laser processing • High-end R&D laboratory • > 20 patent families
- more than 350 systems installed worldwide • Global service network • Blue-chip company customers

Tire Manufacturing

Laser Cleaning and Surface Preparation

Marking, Traceability & Quality Inspection



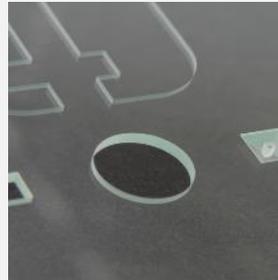
Automotive and General Industry

Laser Cleaning and Surface Preparation



Glass and Thin-Film Photovoltaics

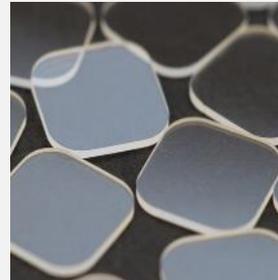
Laser Cutting
Laser Patterning



Micromachining Job Shop Services

Laser Cutting, Drilling & Patterning

Laser Cleaning and Surface Preparation



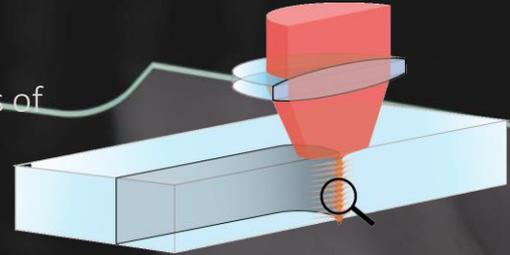
New Business

Surface Functionalisation



4JET's Pearl Cut: The Right Tool for Glass Cutting

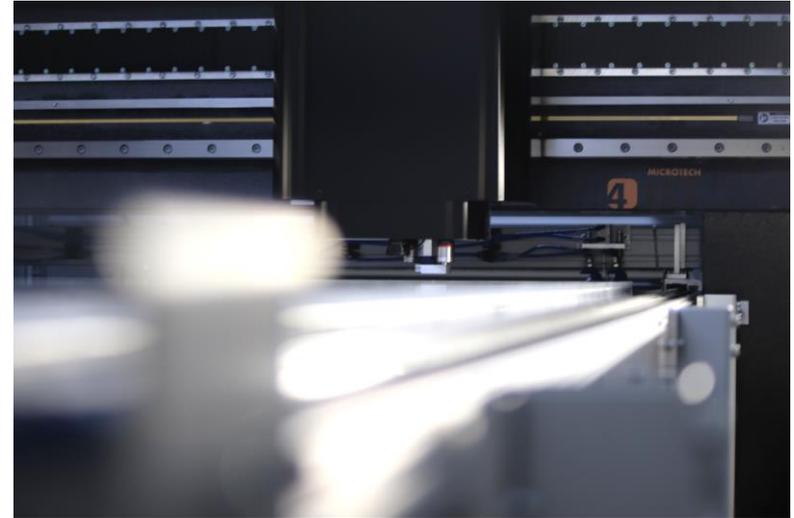
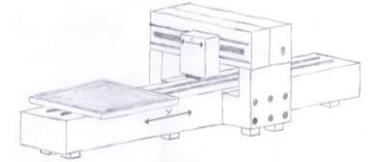
- Laser-Filamentation
 - Ultrashort pulses, strong focusing and focus elongation by means of a special optical element
 - filament forming through almost complete glass body
 - ultra-fine bulk modification (\varnothing 1-3 μm) as result
 - Movement of focus and placing filaments at a certain distance leads weakened cutting line
- Laser-Separation
 - selective CO₂-laser heating along the line of filaments
 - creates temperature gradient transverse to cutting vector
 - as a result tensile stress forms
 - glass separates along filament line



4JET's Solution System Wise: PEARL M, L to XL

Summary

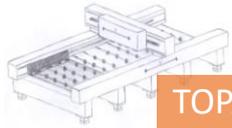
- The PEARL grows with your requirements in its size and capabilities by means of powerful options.
- Different laser sources and optical packages can be integrated to get best solution for your glass specification, whether it is ultra-thin glass or thick architectural glass substrates.
- The PEARL is ideally suited
 - to support back-end mother-glass approach in smart window manufacturing of LC or electro-chrome designs.
 - to process ultra-thin glass
 - to cut thick-glass in architectural applicationsat highest edge quality and contour accuracy!





4JET TOPAZ LS/GS, LS, G
for Laser Patterning of Functional Coatings on flat Glass Substrates

Summary



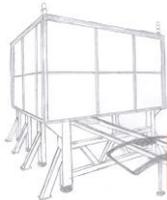
TOPAZ LS/GS



TOPAZ LS



TOPAZ G



TOPAZ 3D

Substrate Geometry	Application	Glass Thickness	Process Strategy	Pattern Resolution
Flat & medium thickness	Architecture Transportation BIPV	1.8 mm - 6 mm	Glass & Layer side	15 μm - 100 μm
Flat & thin	Architecture Smart Windows Transportation	30 μm - 6 mm	Layer side	15 μm - 100 μm
Flat & thin	Smart Window	around 1 mm	Layer side	< 10 μm
curved flat	Car glazing: Windshields Sun roofs Backlites	1.2 mm - 5 mm	Glass & Layer side	\sim 100 μm

Scanning on-the-fly – the same heart beats in every TOPAZ

What is that?

- Scanner mirrors and machine axis are moving synchronized in speed and position
- multiple scanners working in parallel
 - Much higher processing speed compared to step and repeat
 - Almost no stitching error
 - Patterning resolution below 10 μm
- Economical in many applications whether it is Smart Window manufacturing, building integrated PV (BIPV) or flat transportation glass



➤ Excellent product quality at reduced processing time and costs per piece



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Thank You
谢谢
Merci
Vielen Dank