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Precision laser microstructuring and texturing for enhanced automotive lighting solutions

Who we are

Services provider:
- Laser microstructuring
- Surface texturing
- Industrial engraving

WHO

Since 1983:
Pantograph → Die-Sinking → EDM → CNC milling → Nano Laser → Femto Laser

WHEN

Facilities in **Barcelona**

WHERE

Laser texturing advanced solutions:
- 2013: first laser texturing in Spain
- 2016: **pioneers femtosecond laser 5 axis**
- 2022: **femto 5 axis for big and heavy tools**

STATE-OF-THE-ART

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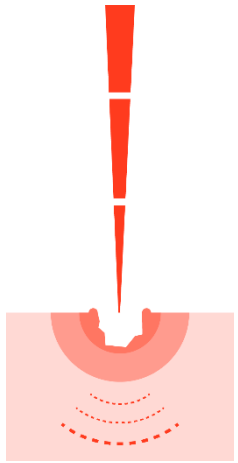
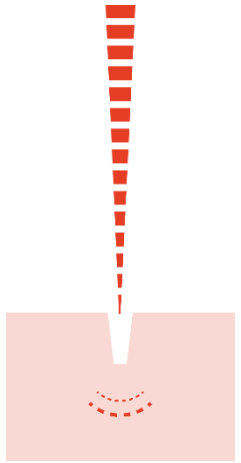
Technology - What a femtosecond laser is?



Nanosecond laser (10^{-9}sec)
Short pulse duration
Heat affected zone
Burr

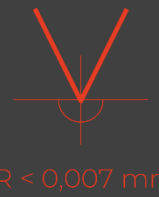


Femtosecond laser (10^{-15}sec)
Ultra-short pulse duration
“Cold” ablation
Absolutelly burr-free

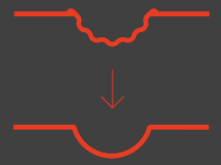
Smaller engraving details
New possibilities in lighting

FREE-FORM MICROSTRUCTURING & MICROTEXTURING

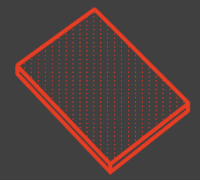
Engraving characteristics of the femtosecond laser:



Clean engraving
with Sharp edges



Absolutely
Burr-free



High-quality
surface finishing

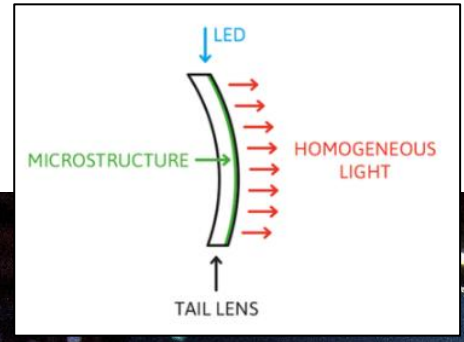
Excellent
tolerances

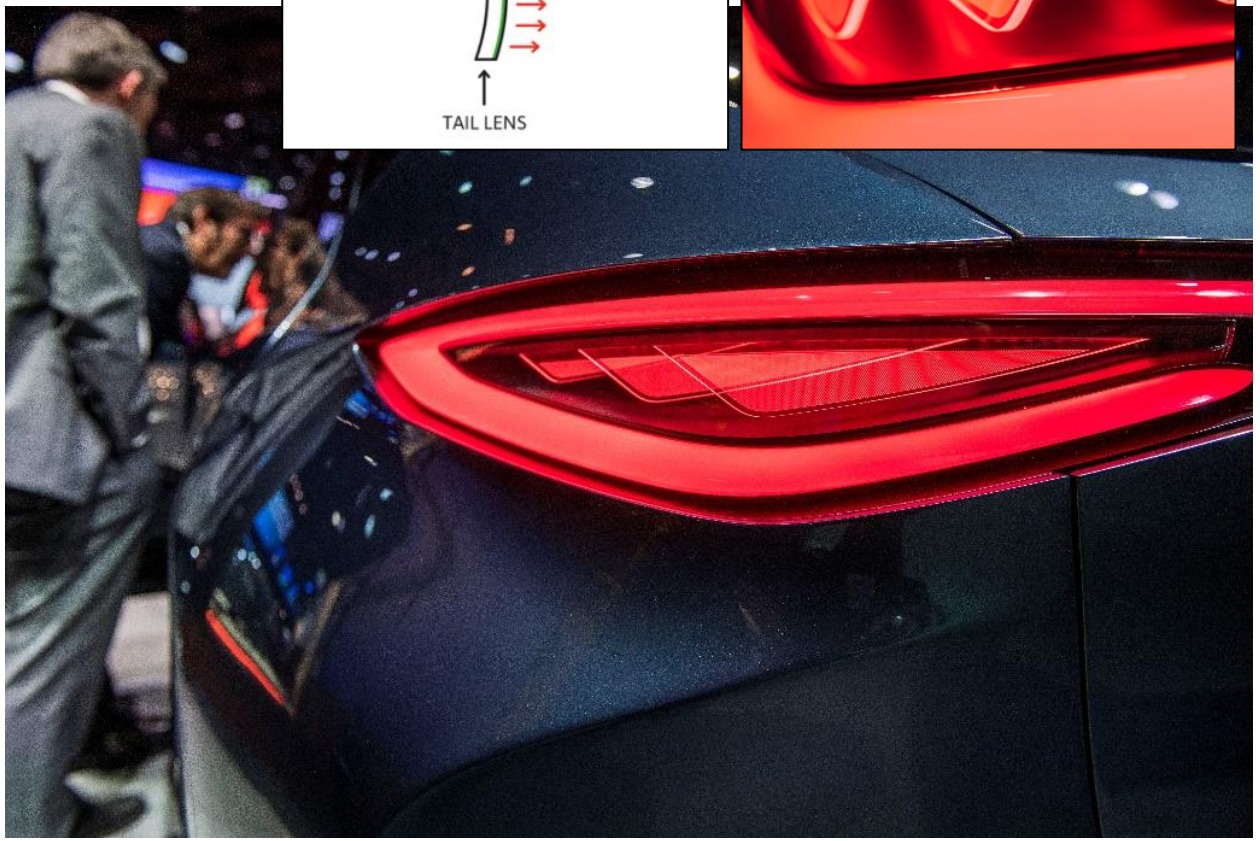
Engraving over
any material

Cupra Tavascan: prototype (concept car)

Cupra Tavascan: prototype (concept car)

Cupra Tavascan concept car: microstructuring for a new concept of tail lenses.
Purpose → reach light homogeneity from a perpendicular placed light source.
Benefit → from uniform lines to uniform surfaces. Possibility to work in three dimensions





Range Rover Sport 2023: prototype + production tool

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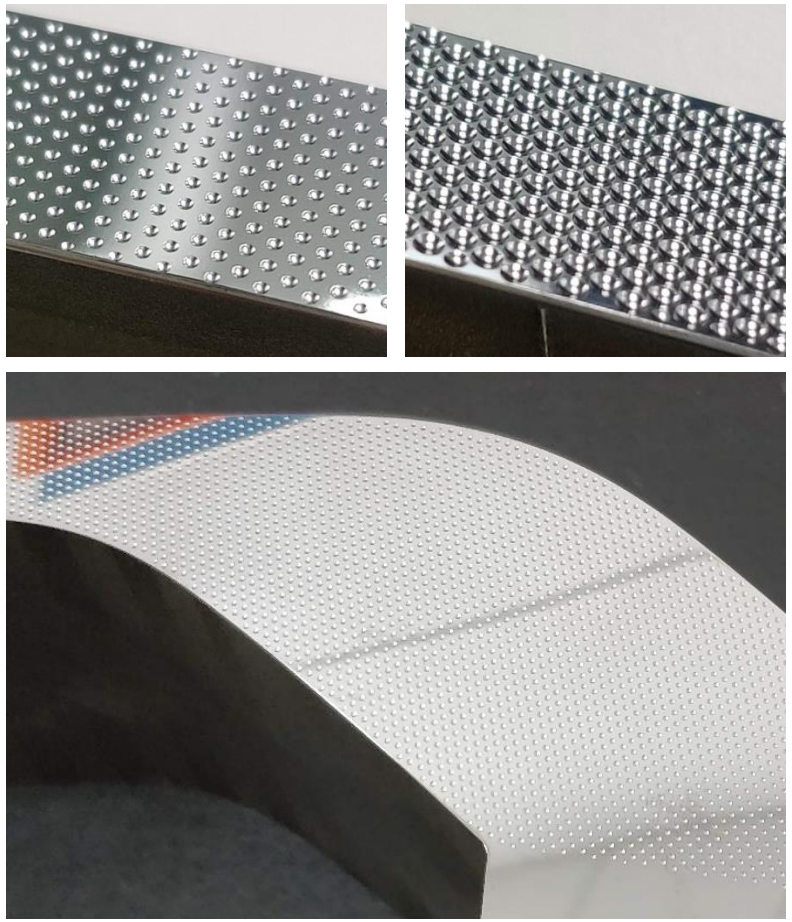
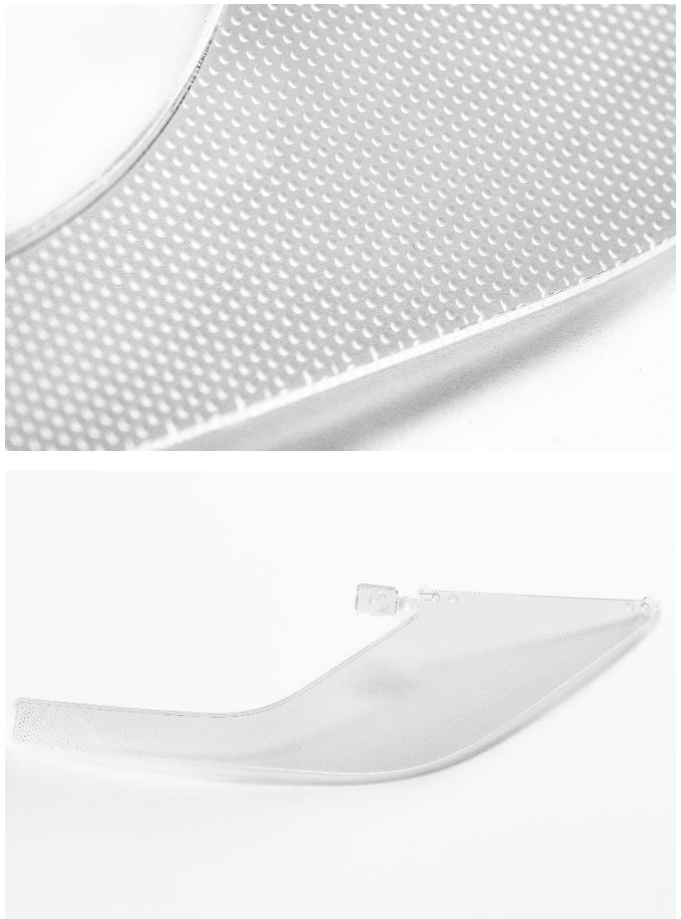
Range Rover Sport 2023: prototype + production tool

Tool microstructuring



Injected parts



Final product – tail lamp

Odelo

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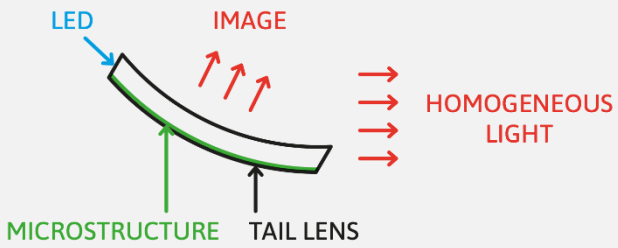
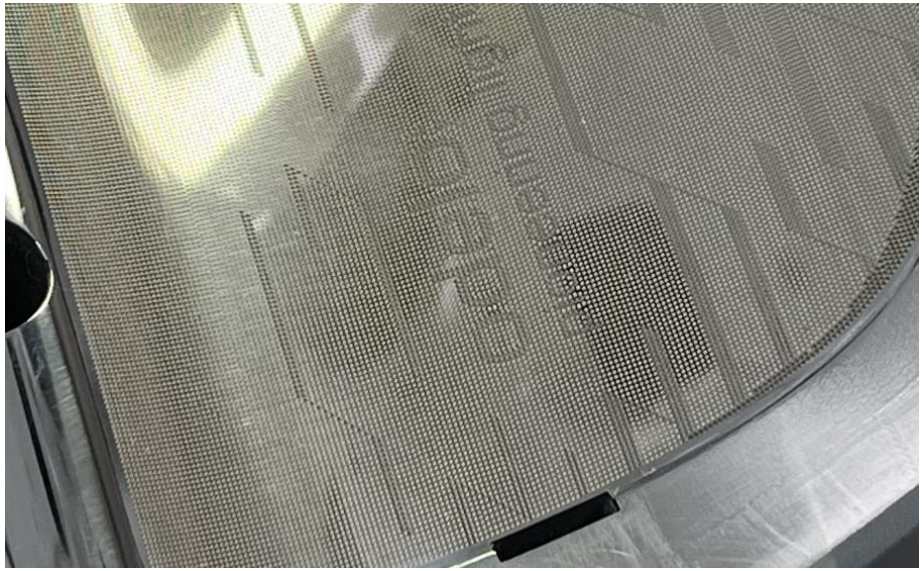
Homogeneous surface
lightguide from behind

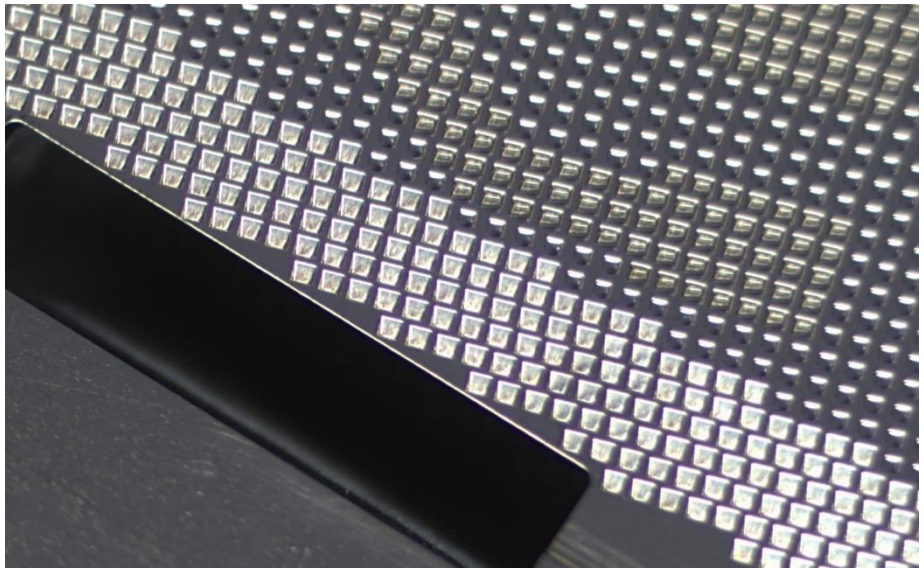
+

Free-form image from above



Engraving of thousands of microprisms in the production tool insert – free-form geometry





Injected plastic parts in the tool

OP mobility - Illuvision

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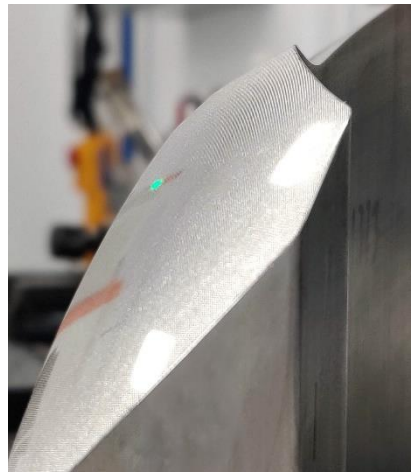
OP mobility - Illuvision

PRODUCTION TOOL INSERTS
Use of state-of-the-art femtosecond laser technology to engrave thousands of tiny micro-optics in the production tool:

- Free-form optics
- High quality finishing
- Homogeneity
- 3D surface

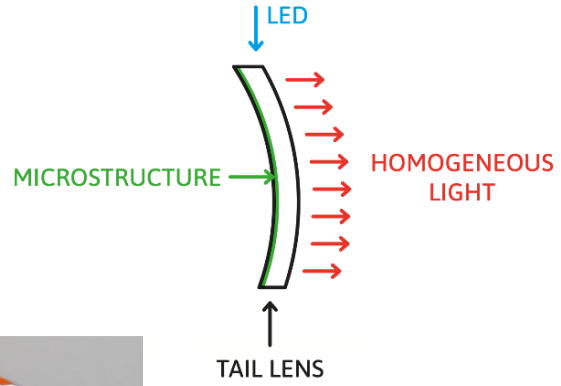


FINAL PRODUCT
Illuvision: new concept of tail lenses

- Ultra homogeneous appearance
- Super-thin frameless design
- Simple concept
- Fully three-dimensional shapes
- Semi-transparent appearance

Prettl

Prettl



PRODUCTION TOOL INSERTS
Use of state-of-the-art femtosecond laser technology to engrave thousands of tiny micro-optics

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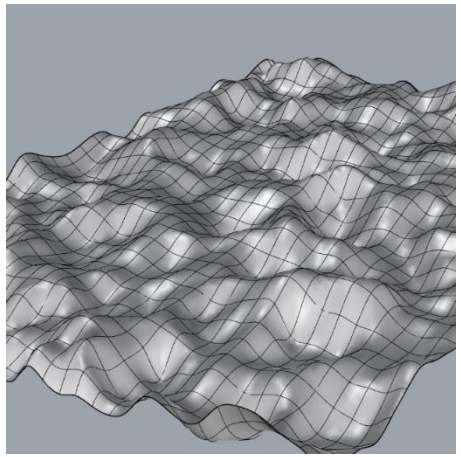
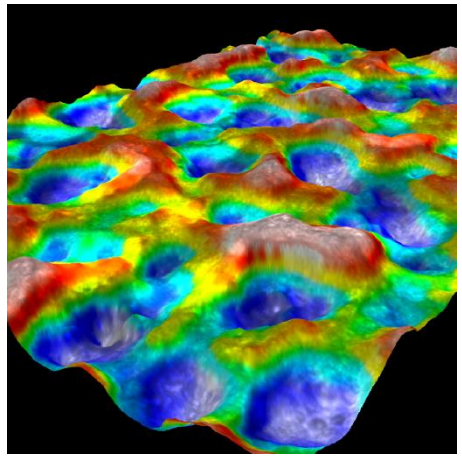
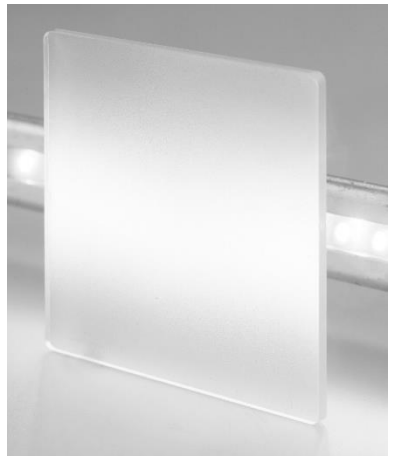
Microscatt® Technology – What is it about?

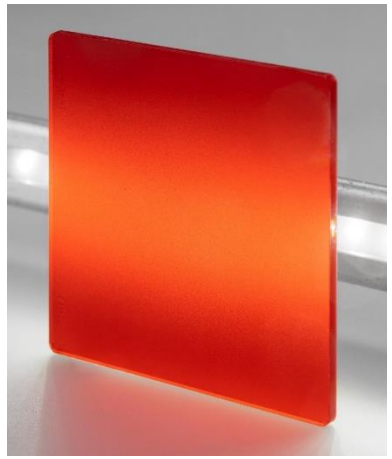
MICROtexturing & **MICRO**structuring for light **SCATT**ering control

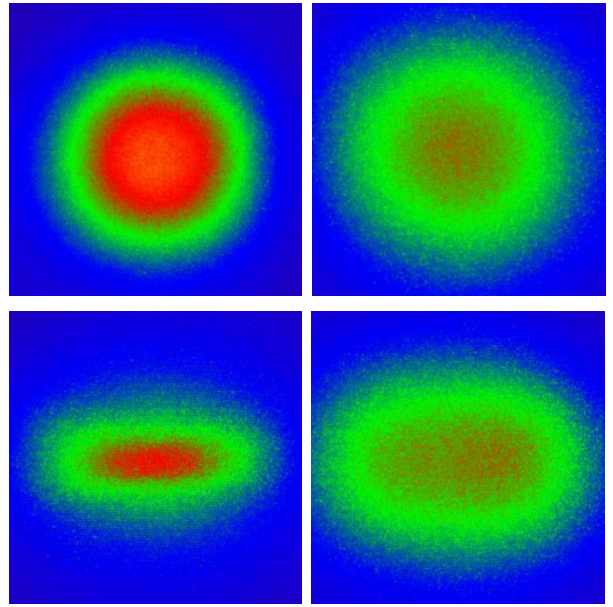
Microscatt® Technology – What is it about?











Microtextures & microstructures engraved with **femtosecond laser directly on the tool for diffusion purposes**	Engraving characteristics: - Homogeneous - Repeatable - Controlled - Small roughness values	Diffusion characteristics: - High-quality diffusion -Great luminance - Good anisotropy level & avoid hot spots or stripes	Burr is having no influence in the light diffusion	The randomness of the texture is controlled by an algorithm
FEMTO LASER	**ENGRAVING**	**DIFFUSION**	**BURR-FREE**	**ALGORITHM**

Microscatt® Technology – How it Works & Benefits

1

Simulation and decision

2

Texture engraving on tool

3

Plastic injection

ENVIRONMENTAL
BENEFITS

- Material reduction
- Easy to recicle
- Energy reduction

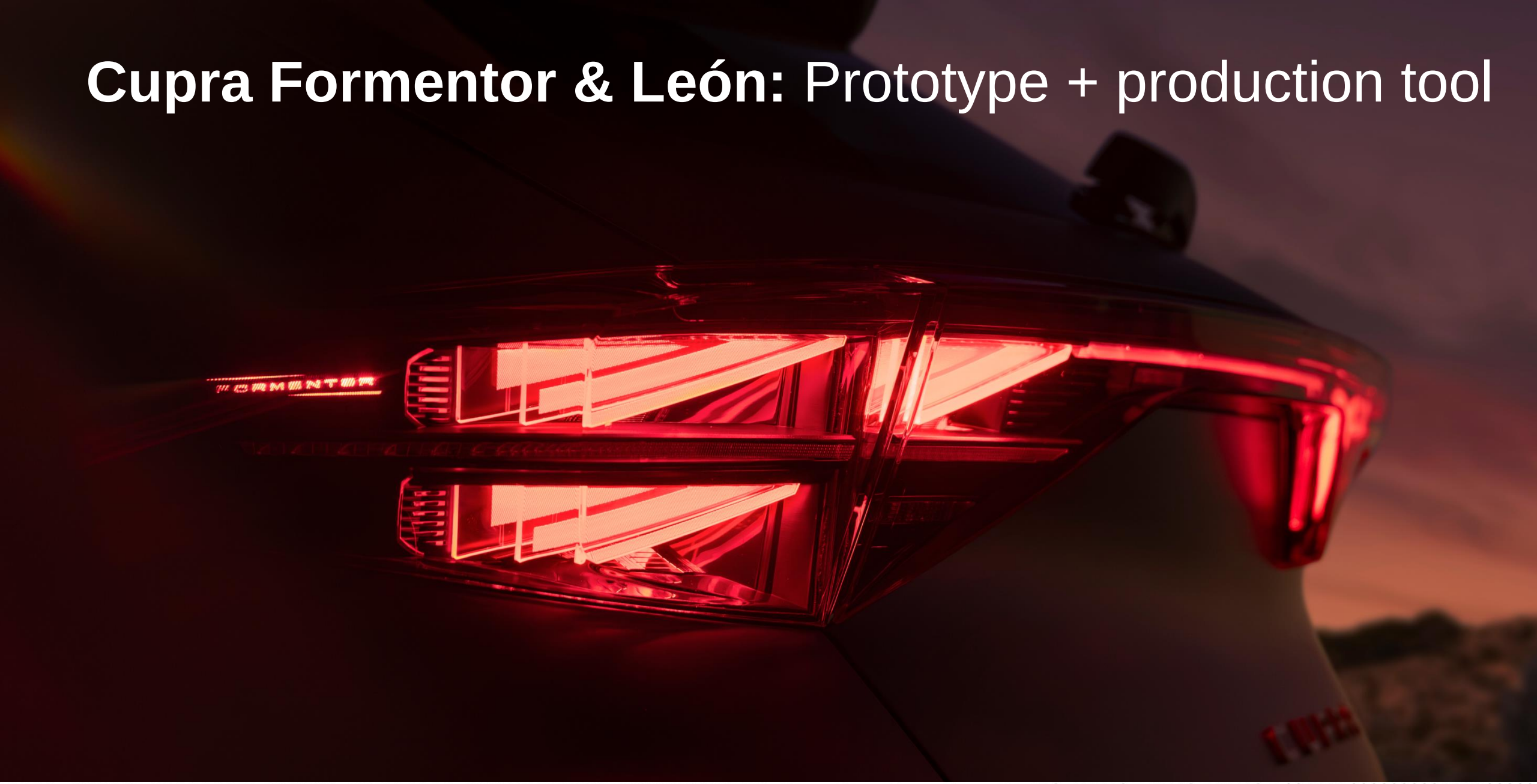
DESIGN
BENEFITS

- Beautiful finishing
- Ultra thick pieces
- Free-form design area

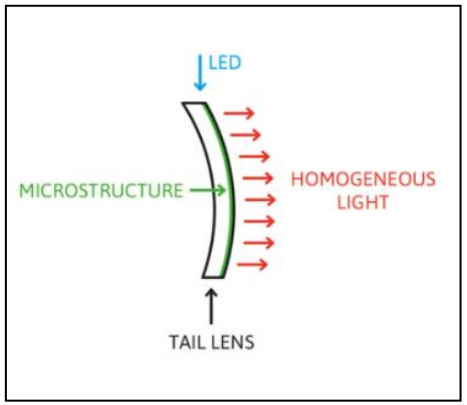
COST-EFFECTIVE
BENEFITS

- Material reduction
- Weight reduction
- Processes simplification

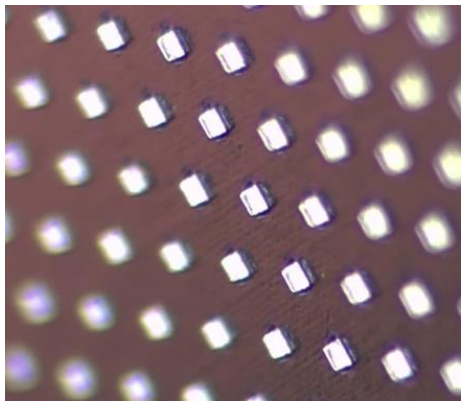
Cupra Formentor & León: Prototype + production tool



Cupra Formentor & León: Prototype + production tool

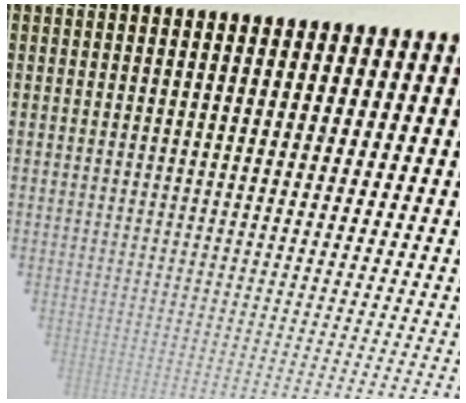


Customer request:
New concept of tail lense

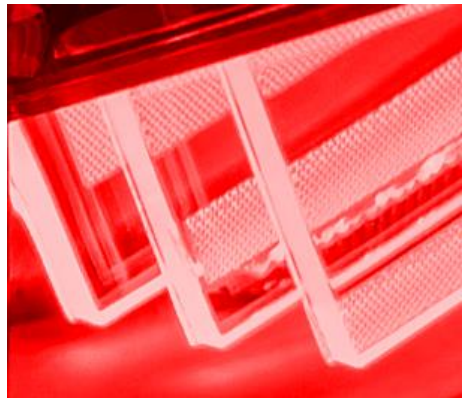


Micro-prisms concept for light distribution

PMMA prototype engraving: engraving on any material



Ultra-precise production tool insert microstructuring



Microscatt technology on production tool inserts

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Other automotive examples

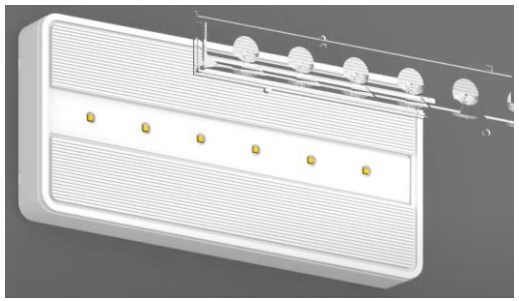
Renault Rafale

Lancia Ypsilon

Fiat Topolino

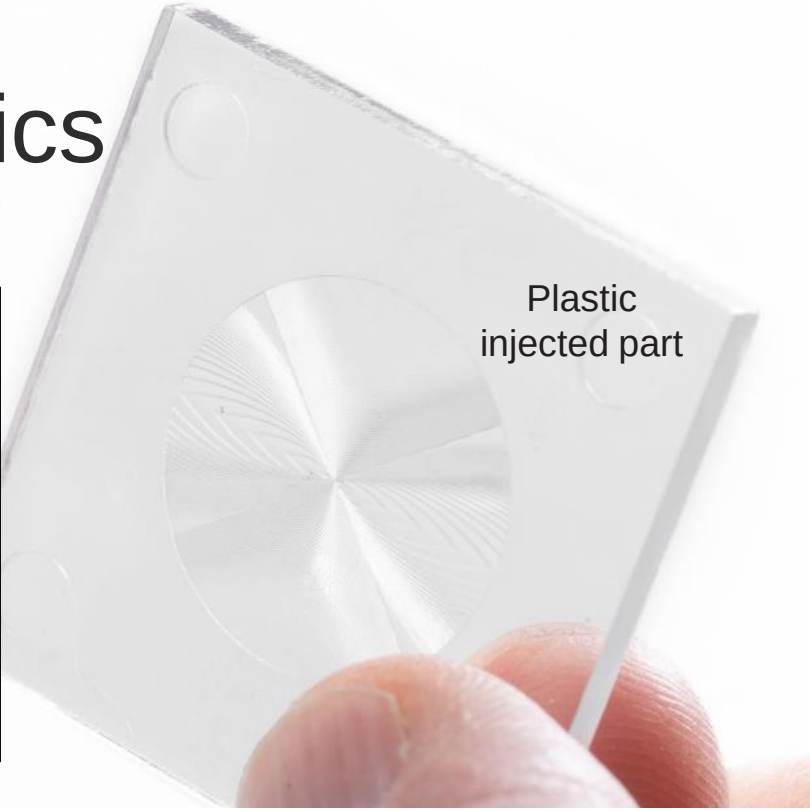
Laser microstructuring – micro-optics

Micro-optics for reduction:	Elements / Complexity Size / Material / Cost

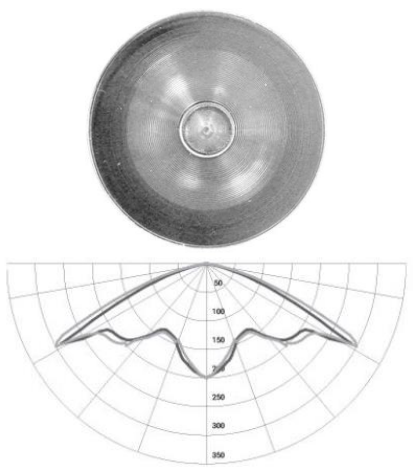


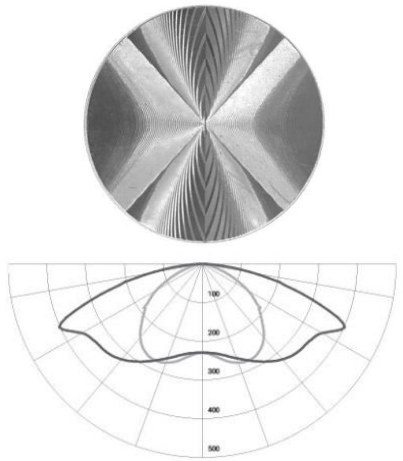
Solution is:	• Functional • Cost-effective • Enviornmentally friendly • Design benefits (2mm thickness; better integration in the space)

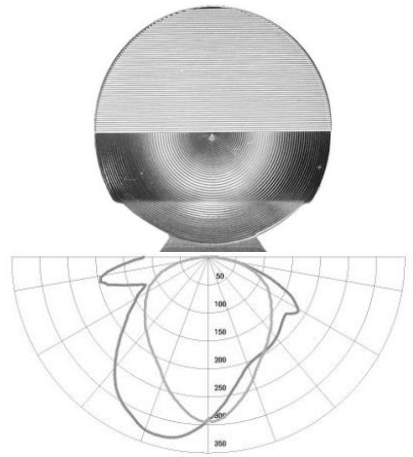
Tool insert



Plastic injected part







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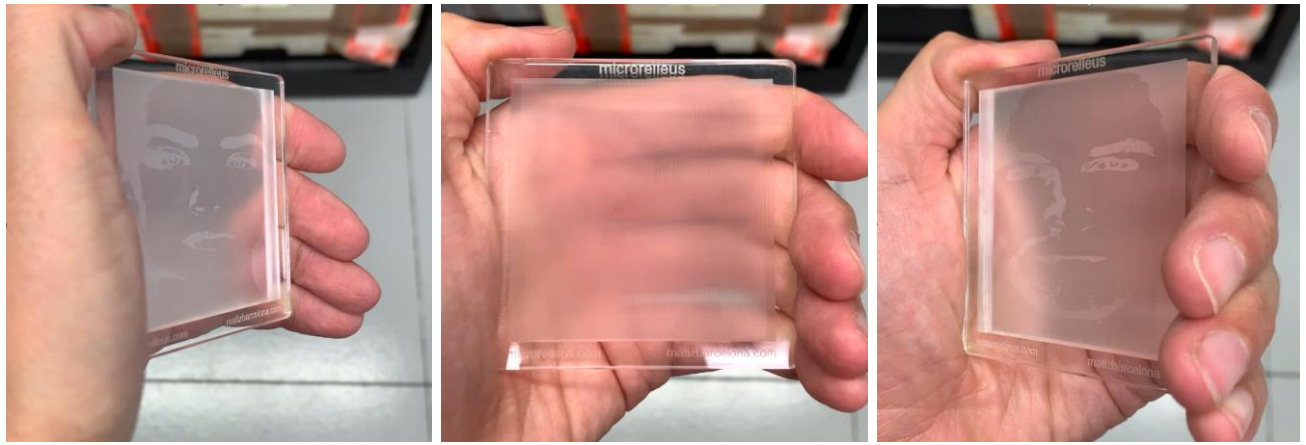
Femtosecond laser - many other possibilities

Holograms



Backlight: controlled coating removal

Anti-glare parts by engraving the tool

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STATE-OF-THE-ART ENGRAVING SERVICES FOR SUPERIOR INDUSTRIAL PERFORMANCES

Laser microstructuring / Surface texturing / Industrial engraving

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