



**MATERIAL MEETS
ENGINEERING**
FRANKFURT 2019

Trends in automotive industry lead to new requirements for laser applications for interior and exterior parts

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Agenda

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JENOPTIK AG
Company introduction

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perforation

02

Our Motivation - Trends in
automotive industry

04

Summary

01

JENOPTIK AG
Company introduction

Light & Optics OEM Business



OEM supplier with focus on being a development and production partner for key technologies based on photonics

Photonics at the heart of our OEM customers products

Light & Production B2B Business



Engineering with a focus on smart manufacturing and process automation solutions for industrial customers

Driving production efficiency with photonics

Light & Safety B2G Business



Imaging based solutions for Public Safety in combination with intelligent data management

Making roads and communities safer

VINCORION



Mechatronic solutions for partners in the aviation, security and defense industries

Mechatronic solutions in challenging and regulated environments

834.6

million euros revenue 2018 (+11.6 percent)

94.9

million euros EBIT 2018 (+21.6 percent)

4,043

employees worldwide (as of Dec 31, 2018)

Division Light & Production

Where do we come from?



Metrology



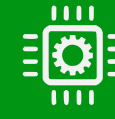
Solid metrology and optical inspection solutions for manufacturing processes



Laser Processing



Advanced laser based production solutions for manufacturing processes



Automation



High flexible automation solutions for manufacturing processes

Powertrain

Interior & Exterior

Body-in-white

All activities primarily focused on automotive industry

02

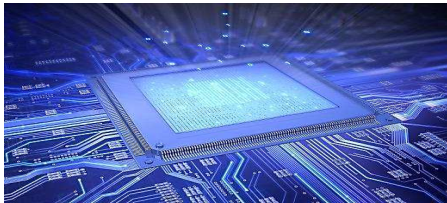
Our Motivation - Trends in automotive industry

Our Motivation

Trends in automotive industry

Changes in automotive industry

Digital world



44 trillion gigabytes
data volume in 2020.

Growing infrastructures



43 Megacities with more than
10 million inhabitants in 2030.

Mobility & efficiency



2.5 cars every second are
produced worldwide.

Automotive megatrends

Future manufacturing



Flexible production & high
level of **functional integration**.

Autonomous driving



Vehicles will be **customizable**,
relax, business, family.

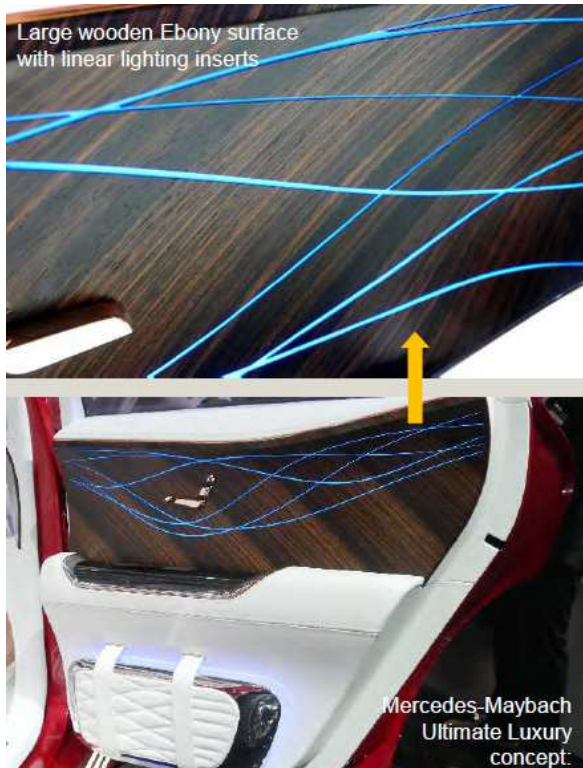
Smart surfaces



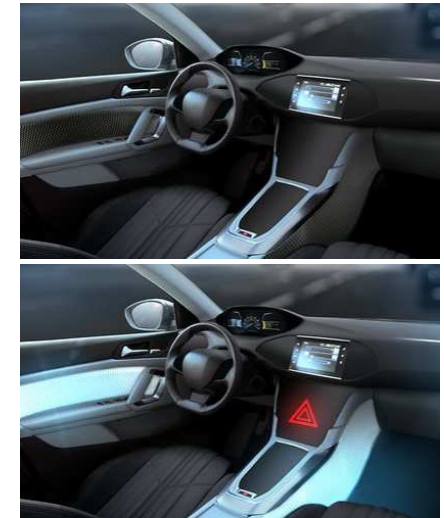
Function on demand, creating
less distracting interaction
surfaces with cleaned design.

Our Motivation

Trends in automotive industry



Source: VDI-Fachkonferenz Automobiles Cockpit – 2018 - Car Men GmbH



Source: Internetseite Continental AG

<https://www.continental-corporation.com/de/produkte-und-innovationen/innovationen/automatisiertes-fahren/innenraumdesign-147482>

03

New lighting concepts via micro-perforation

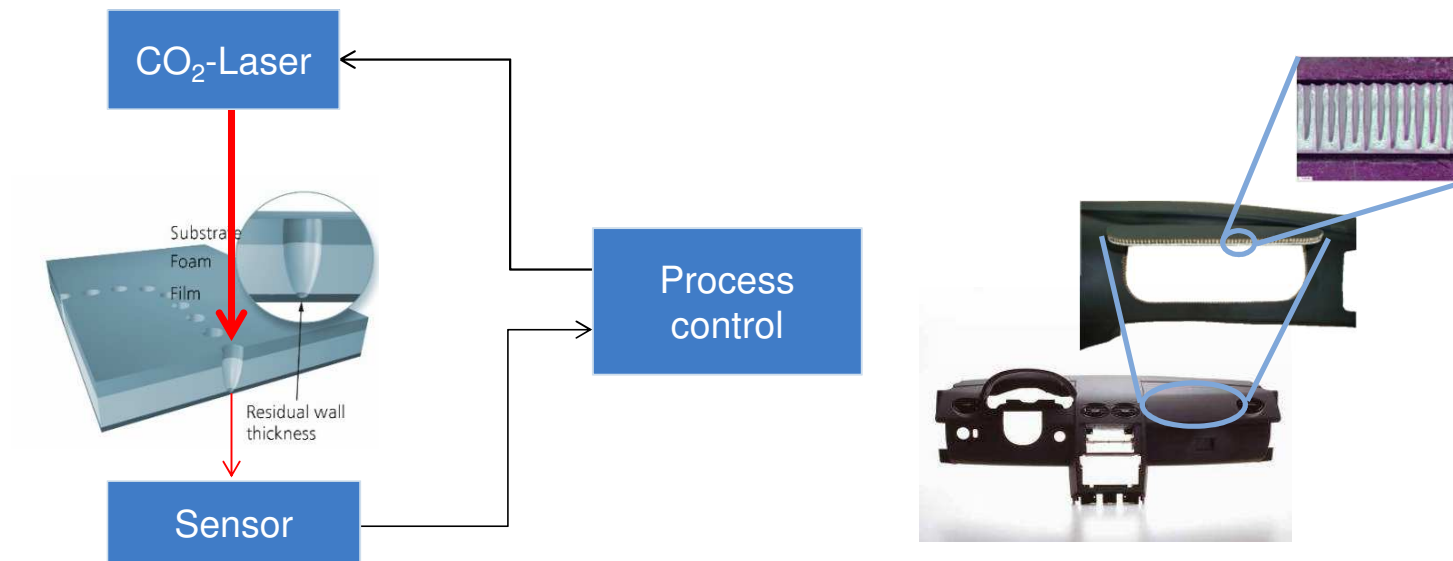
New lighting concepts via micro-perforation

New potential applications due to the combination of femtosecond pulse ablation and JENOPTIK's well established laser weakening process for airbag covers



New lighting concepts via micro-perforation

Process principle laser weakening technology



- Laser creates invisible break line along the airbag contour by stringing together individually controlled holes from the material backside
- Sensor technology prevents the material being completely penetrated by the laser

New lighting concepts via micro-perforation

Process principle laser weakening technology

Possible materials and material combinations:

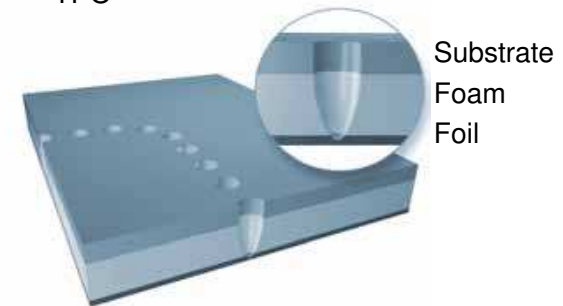


Soft instrument panels Hard instrument panels

- | | |
|---|---------------------------|
| - PP-LGF / PU foam / PVC skin | - PP |
| - PC-ABC / PU foam / TPO foil | - PP-GF |
| - PP-LGF / TPO foam foil | - PP flax / textile decor |
| - PC-ABS / PVC foam foil | - PP / foil (TPO, PVC) |
| - PP-LGF / spacer fabric / PU foil | - TPO |
| - flexible TPE / PU foam / TPO foil
(e.g. for knee bags) | |

Additional cover versions

- kneebag
- thorax

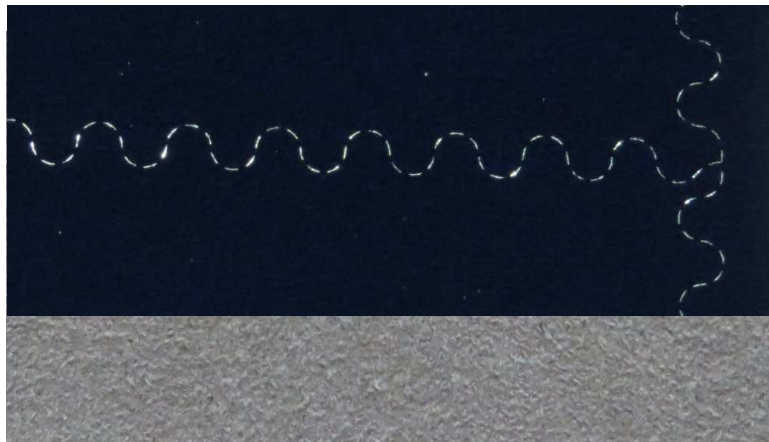


New lighting concepts via micro-perforation

Ultra fast lasers for macro applications

New ways enabled by JenLas[®] femto

- Pulse duration: 550 femtoseconds (femto = 10^{-15})
- Average power: 16 W
- Non-thermal “cold” laser processing, damage-free
- Extremely clean, precise and, free of melt, bur and debris

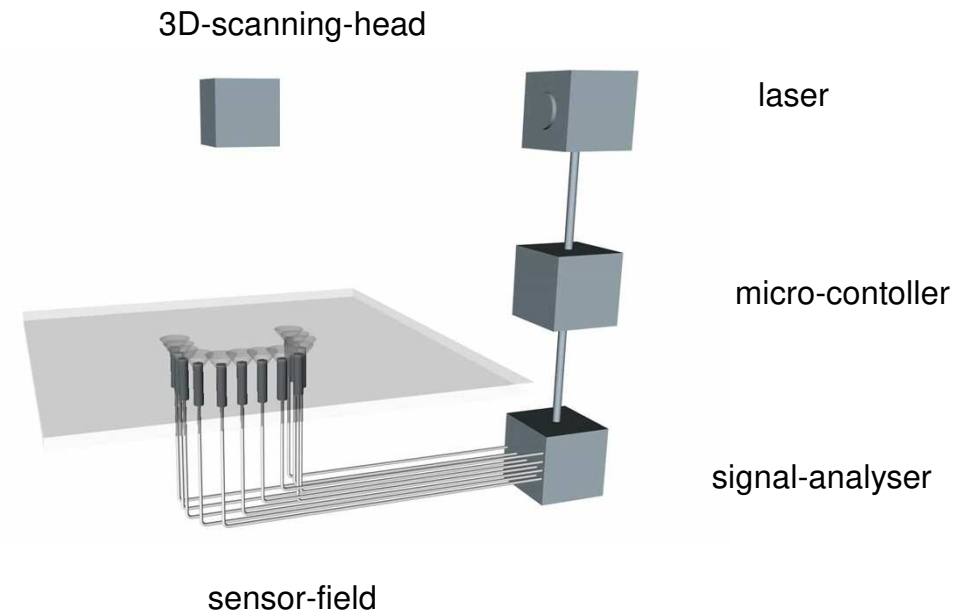


New lighting concepts via micro-perforation

Ultra fast lasers for macro applications

Technology concept

- 3D-scanning equipment for high dynamic performance
- Low heat impact by multi cycle operation
- Closed loop control by multiple sensor array
- Enabling new materials using, e.g. genuine leather, PU spray skins, compound materials, etc.
- Enabling high-precision and selective material ablation (structuring, perforation, drilling)

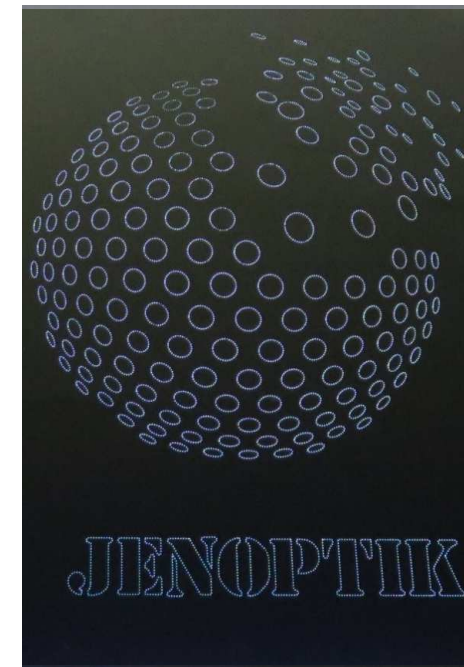
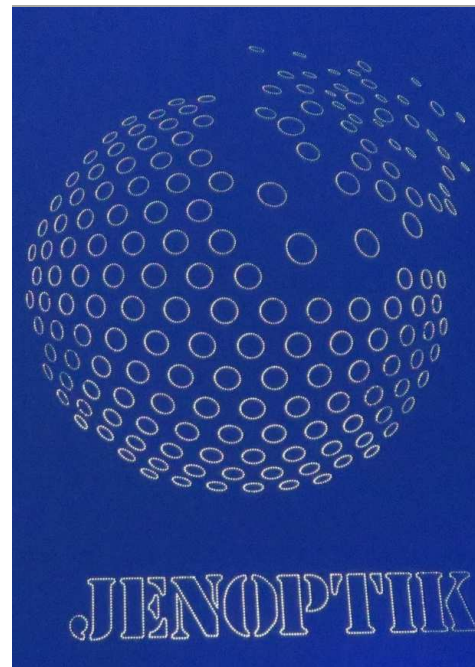


New lighting concepts via micro-perforation

Light through painted surfaces via paint removal

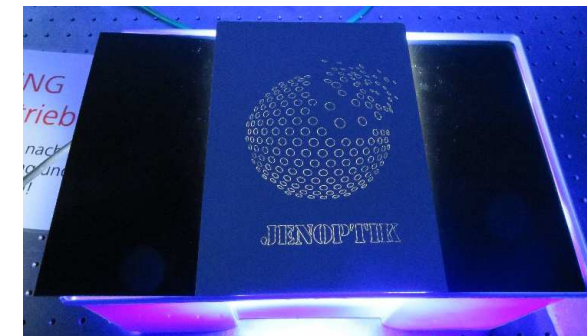
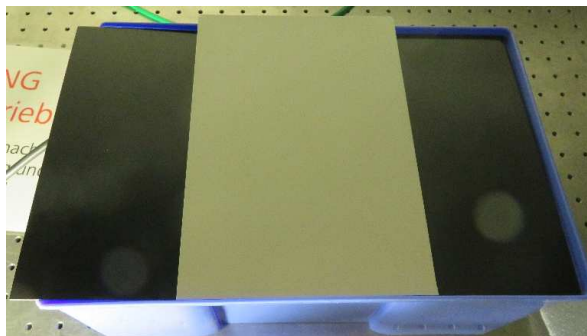
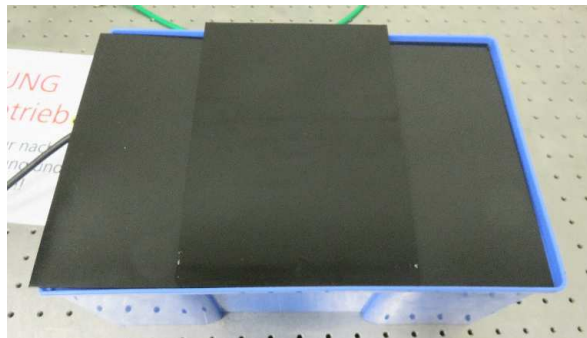
Paint structuring at the front

- Selective paint removal along the light contour
- Diameter processing points < 50 μm
- Light is shining through the translucent substrate material
- Paint layer must be lightproof for sufficient contrast
- Invisible from A-surface



New lighting concepts via micro-perforation Light through painted surfaces via paint removal

Paint structuring at the front

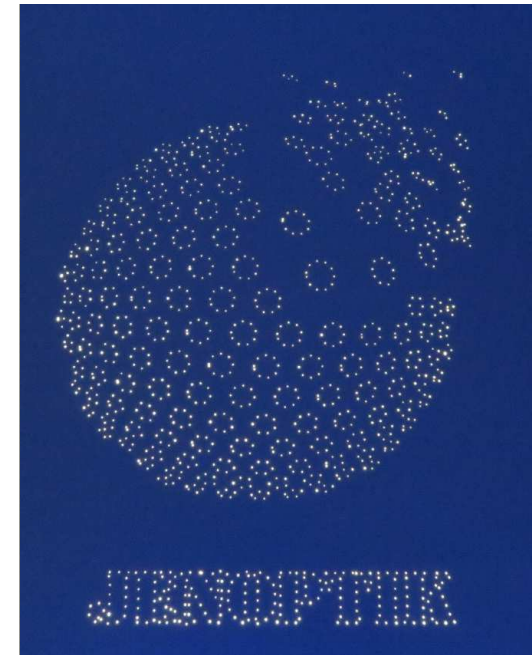
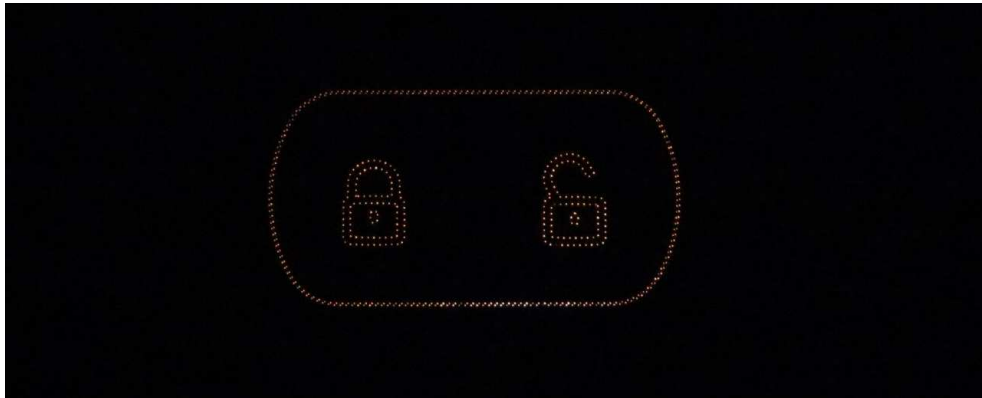


New lighting concepts via micro-perforation

Light through painted surfaces via perforation

Component perforation

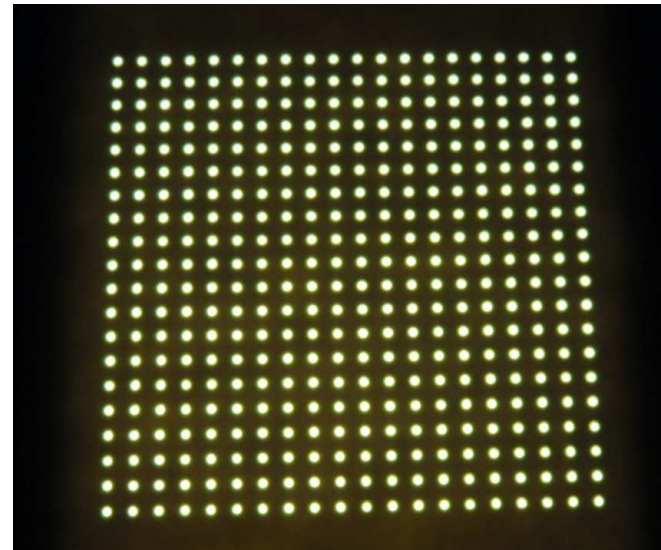
- Perforation (material ablation) along the light contour
- Light is shining through the opaque substrate material along the perforated contour
- Invisible from A-surface



New lighting concepts via micro-perforation Multi-functional surfaces via laser structuring

Surface structuring

- Structuring, perforation or local thinning of decors, fabrics, leather etc.
- Variable in geometries (circle, triangle, square, ...)
- Enhanced functionality in regards to safety, comfort, design freedom and personalization

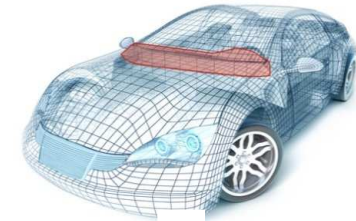


04

Summary

JENOPTIK Automotive - Megatrends driving our business

- The vehicles and the mobility of the future are changing dramatically
 - “It’s more than a vehicle!”
- Trends in automotive industry lead to new requirements in interior and exterior components
- Variety of function integration and digitalization, one major trend – ambient lighting
- Plastics as a lightweight material will further penetrate into the automotive industry



Change is on the way - but changes lead to opportunities!

Application Support Center Join us for a test drive to verify your investment!

Innovative laser technologies for flexible automotive production:



- Prototype production
- Pre-series testing
- Development of material related processes

- Support of process related product design
- Training
- 15 different laser machines available

Test your own applications with our application team.



Thank you for your attention.