



Technologie mit Weitblick

# Free Form Optics for Automotive Applications

EPIC Online Technology Meeting

Dr. Daniela Karthaus, 17.03.2021



# Introduction HELLA

## Company profile

### FACTS & FIGURES

- Founded in 1899 and today one of the leading suppliers for automotive industry and aftermarket
- Global market-listed, family-owned company with more than 125 locations in some 35 countries
- Around 36,000 employees worldwide, thereof almost 8,000 in Research & Development
- Attractive business portfolio with the three segments Automotive, Aftermarket and Special Applications

### DIVISION AUTOMOTIVE LIGHTING - PRODUCTS

Headlamps and modules



Rear lamps



Car body lighting



Interior lighting



Lighting electronics



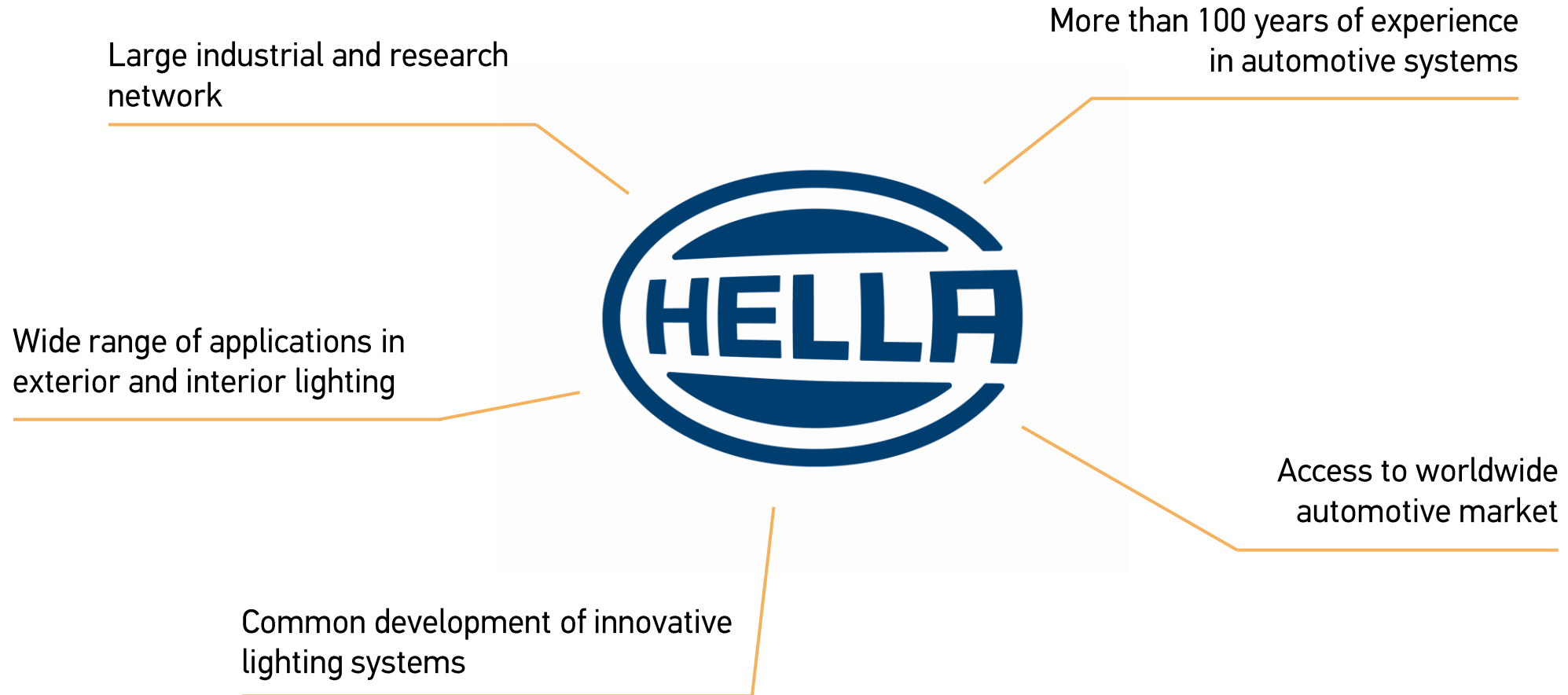
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# Introduction HELLA

## What we provide

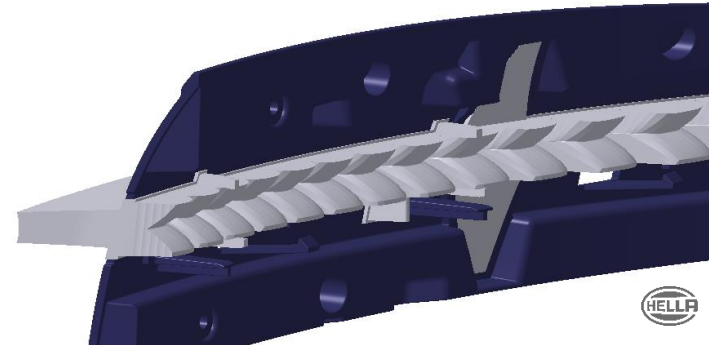
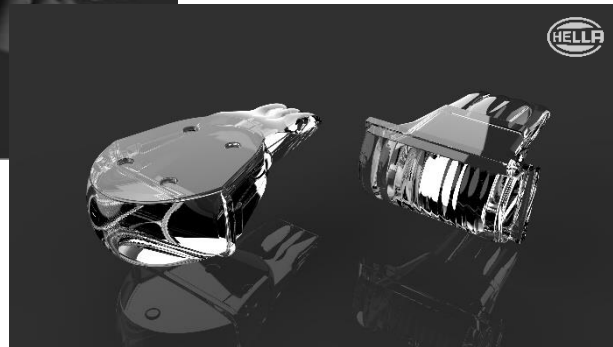
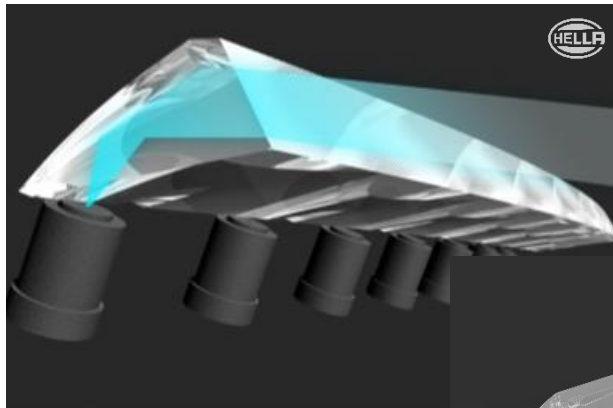
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# Free form optics in automotive applications

## Standard macro free form optics in headlamp and rear lamp systems

- Free form optics (FFOs) are integrated in lighting systems since many years
- Typical applications for FFOs are TIR and imaging optics for headlamps and in- and outcoupling optics for lightguides in rear and signal lamps
- Classical free form optical elements are manufactured with standard injection molding process
- Disadvantage are the size of these components and the often-visible optical structure / surface



# Free form optics in automotive applications

## New styling and functionality with free form micro optics

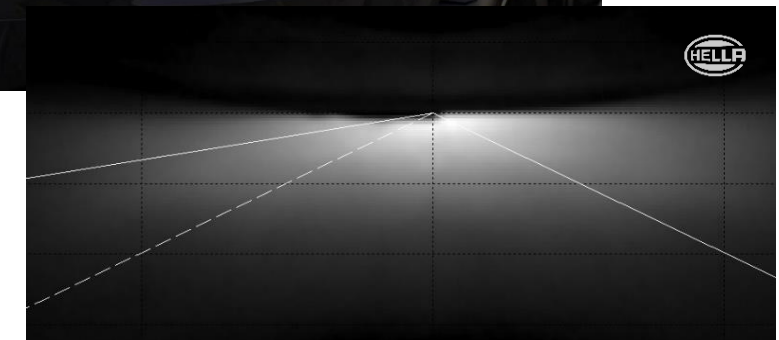
### Advantages of free form micro optics:

- Increase of efficiency compared to other optical approaches
- Reduction of installation space and weight
- New styling options

Latest development for rear lamps:  
HELLA FlatLight | $\mu$ MX



Current research: **PHABULO $\mu$ S**  
free form micro optics for headlamp applications



Phabulous

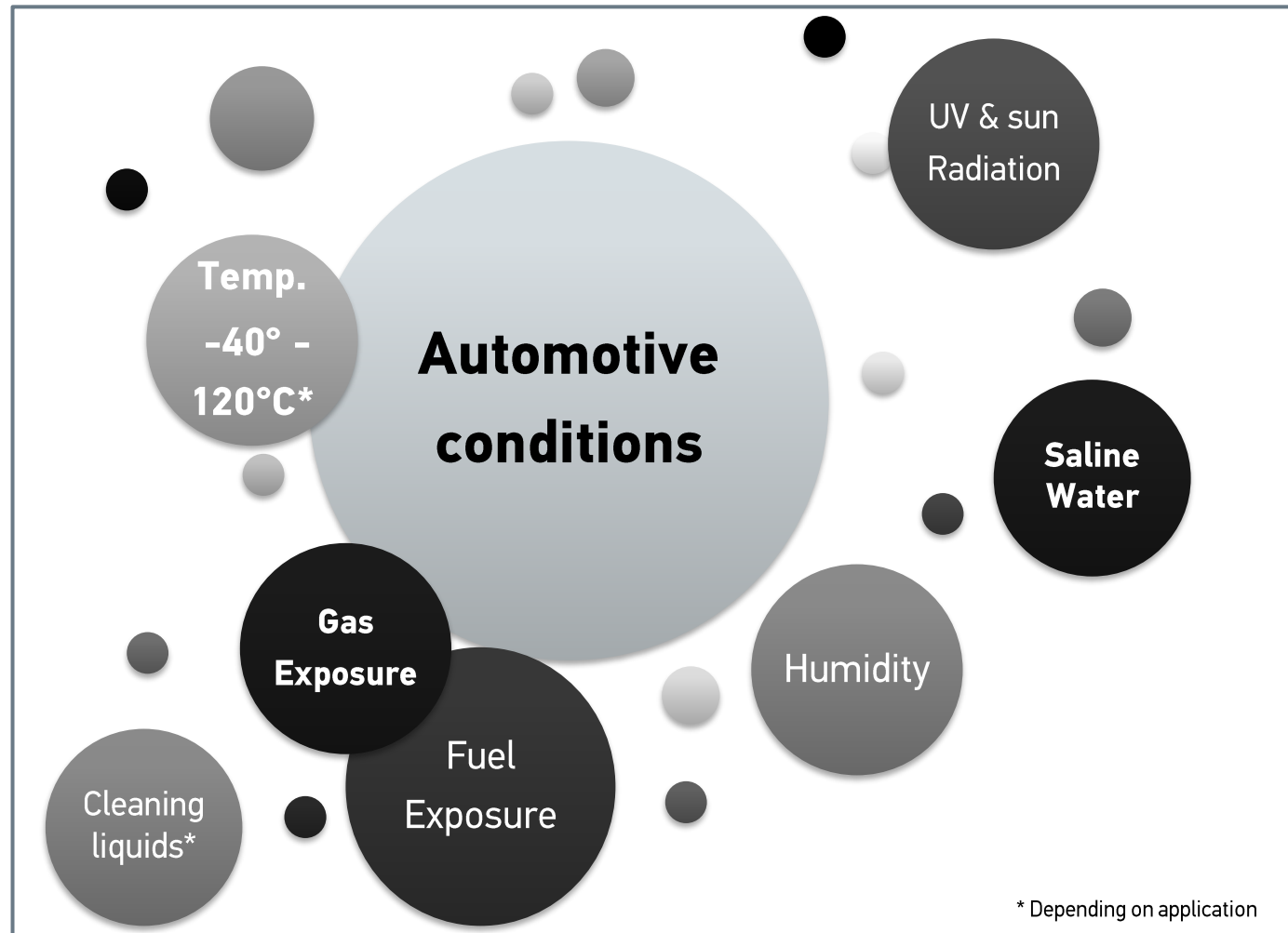


PHOTONICS<sup>21</sup>

PHOTONICS PUBLIC PRIVATE PARTNERSHIP

# Free form optics in automotive applications

## What we demand



### Requirements for optical materials and material bonds

- No deformation
- No delamination
- No yellowing or turbidity

### Requirements for optical components in mass process

- Usage of automotive certified materials
- 3D-curved substrates
- Cost effective mastering and series production

Image based on: B. Willeke: *freeform micro-optics for automotive applications*. SIA Vision conference 2021



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# Thank you

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