



SCHOTT enabling high volume manufacturing of Geometric Reflective Waveguides

DR. RÜDIGER SPRENGARD | SCHOTT AG | Oct 14, 2026

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SCHOTT

Agenda

01

Waveguide
Technologies

02

New material
RealView® 2.0
Lightweight for
Diffractive Waveguides

03

Status
Industrialization
Geometric Reflective
Waveguides



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Geometric Reflective
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Market segmentation ongoing



Contextual Augmentation

- Fashion first
- Lightweight
- FoV 20° - 30°



Full Immersion

- User experience first
- Wearing comfort
- FoV 40° - 60°+



Market segmentation ongoing



Contextual Augmentation

- Fashion first
- Lightweight
- FoV 20° - 30°
- Target price: ~400 – 600 US\$



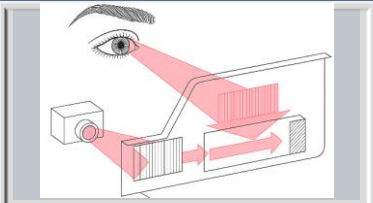
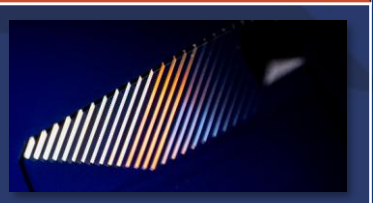
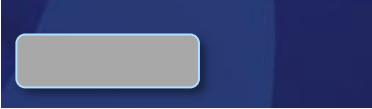
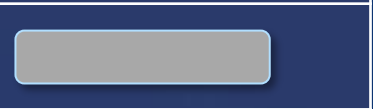
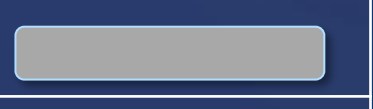
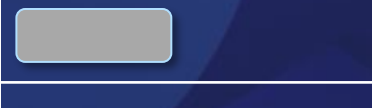
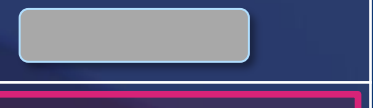
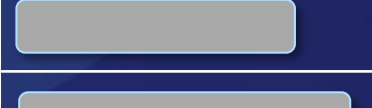
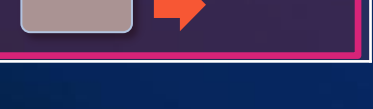
Full Immersion

- User experience first
- Wearing comfort
- FoV 40° - 60+°
- Target price: ~500 – 800+ US\$



Waveguide technologies competing ... and coexisting

Diffractive vs. Reflectives

Diffractive	WAVEGUIDES	Reflective
		
	Image quality	
	Efficiency	
	Low artefacts	
	Tech readiness	
	Ecosystem size	



SCHOTT's unique, fully integrated manufacturing set-up



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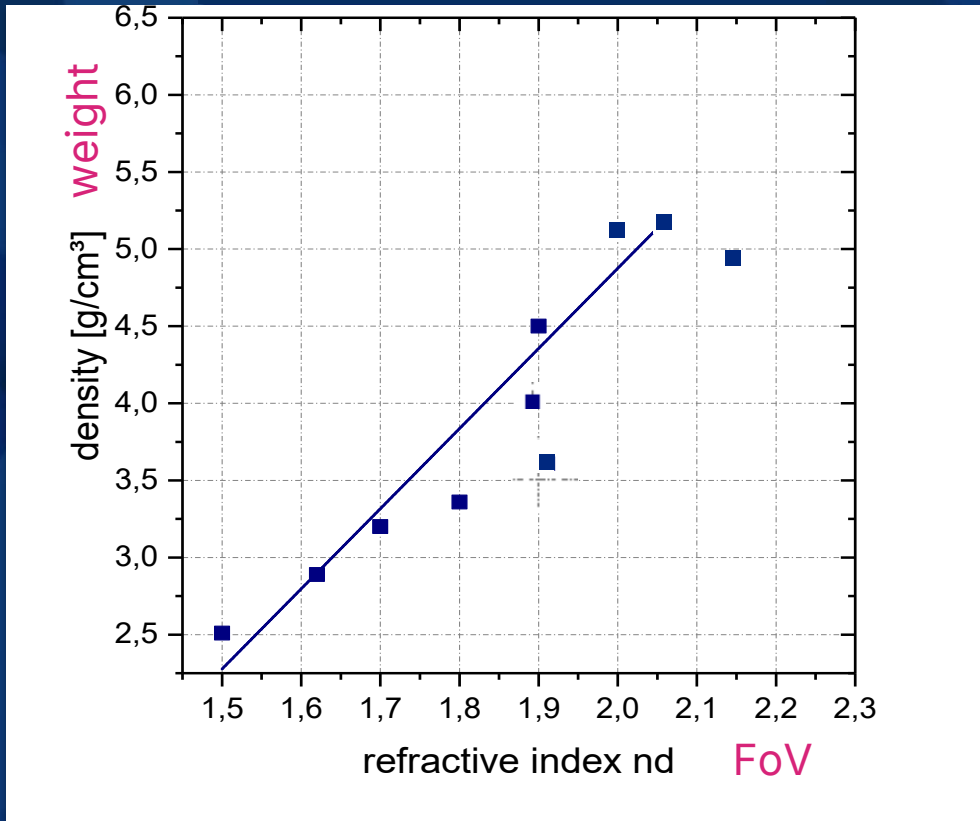
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SCHOTT RealView® with mass production track record

Track record of shipping ~500,000 thousand wafers for global Augmented Reality customers

Material Portfolio



Wafer portfolio

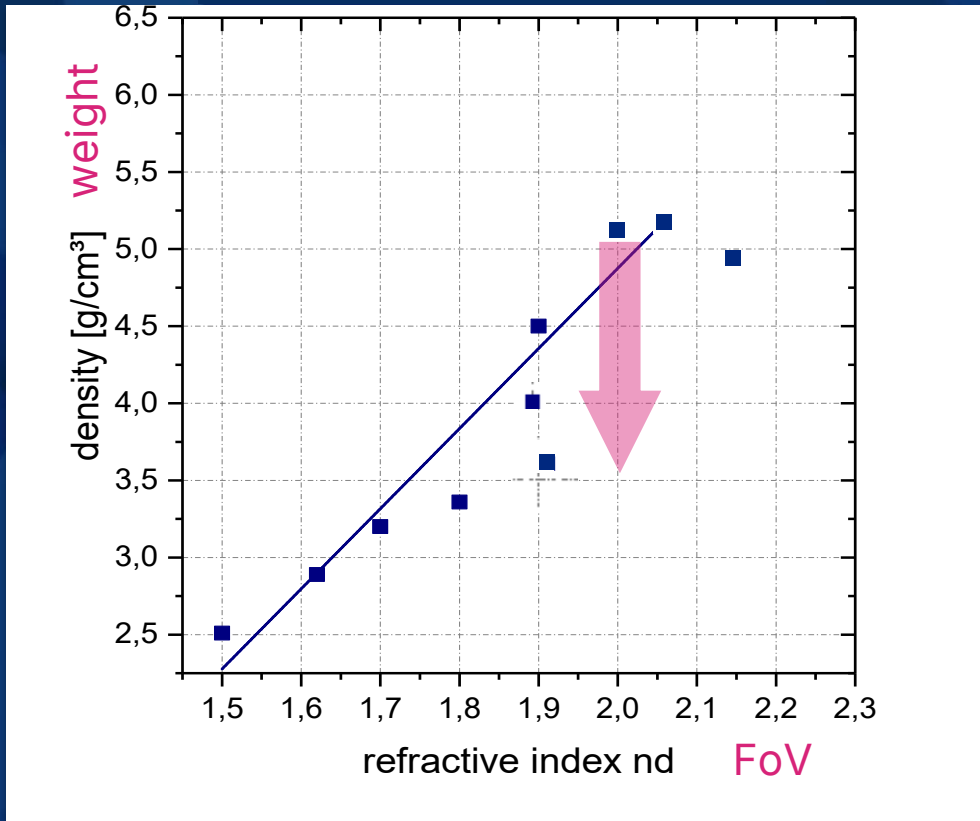


- Diameter 150 / 200 / 300 mm
- Thickness $\geq 250 \mu\text{m}$ $\Rightarrow$ chemical toughening
- Flatness/ TTV $< 0.2 \mu\text{m}$
- MP readiness $> 500,000$ shipped

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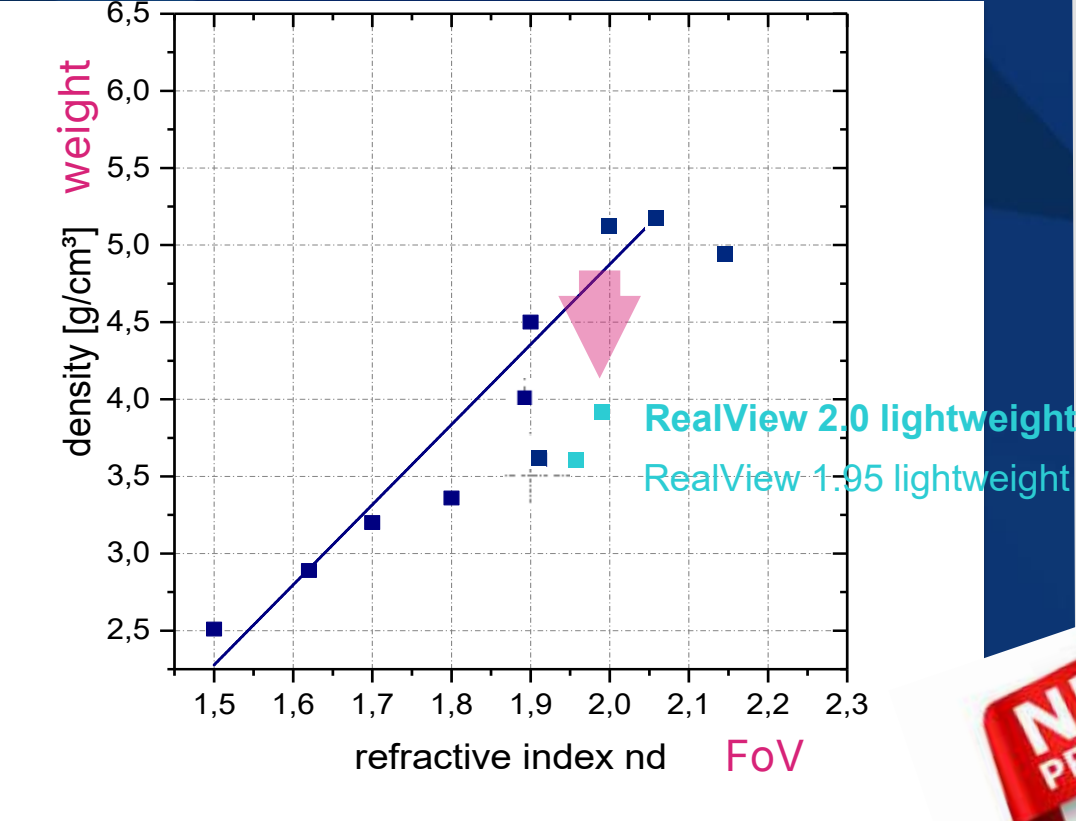


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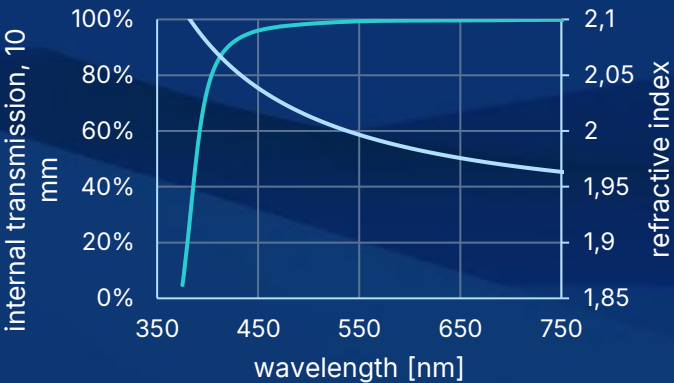
SCHOTT RealView® with mass production track record

Track record of shipping ~500,000 thousand wafers for global Augmented Reality customers

Material Portfolio Update



RealView® 2.0 lightweight	
Glass family	Silicate
n_d	1.987
n_d	21,97
Density	3.95 g/cm ³ ~25% reduction
Transmission Ti@ 460nm/10mm	~96-97% !!!
Hardness	~550-600 HK

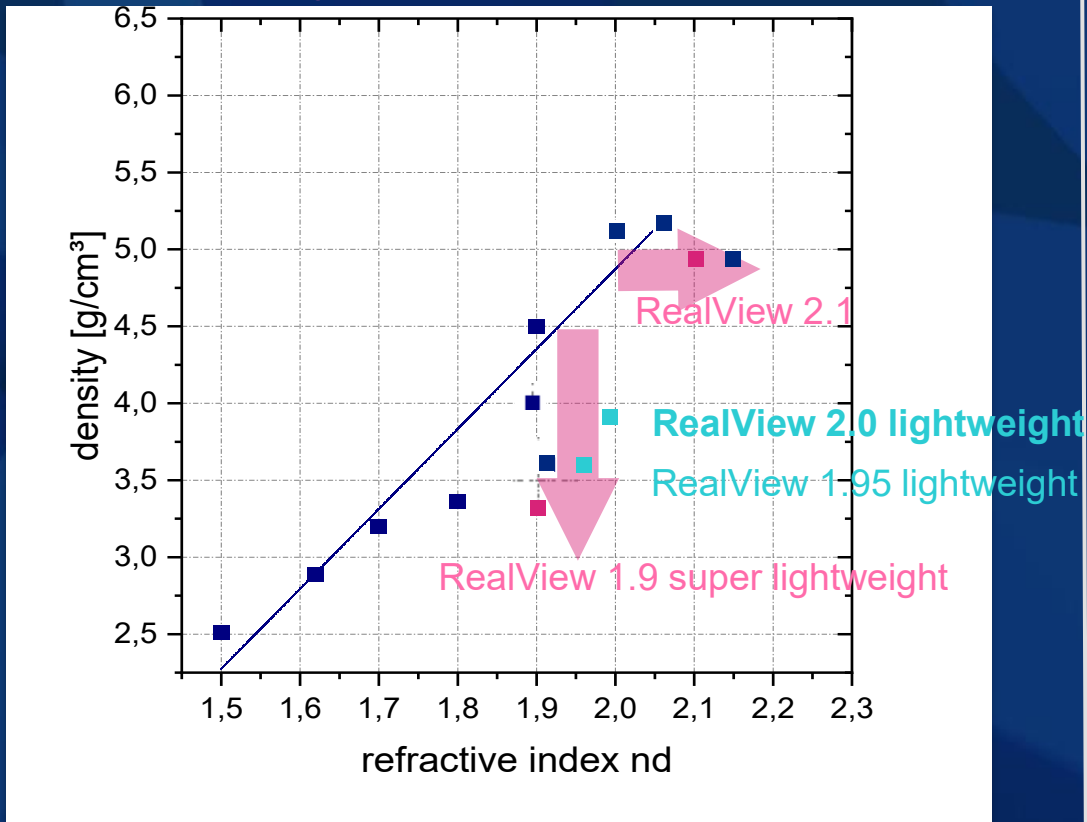


SCHOTT RealView® with mass production track record

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Material Portfolio Update and Roadmap

Next-gen materials in the pipeline



Wafer portfolio Update



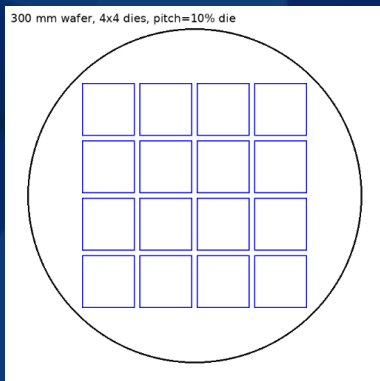
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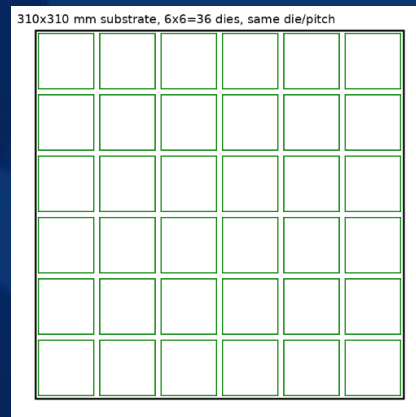
Industry is exploring new formfactors

300 mm Ø, 16-20 eye pcs



+33-50%

310 x 310 mm², 36 eye pcs



Wafer portfolio Update



- Diameter 150 / 200 / 300 mm, 310*310 mm²
- Thickness $\geq 250 \mu\text{m}$ $\Rightarrow$ chemical toughening
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Cooperation partner

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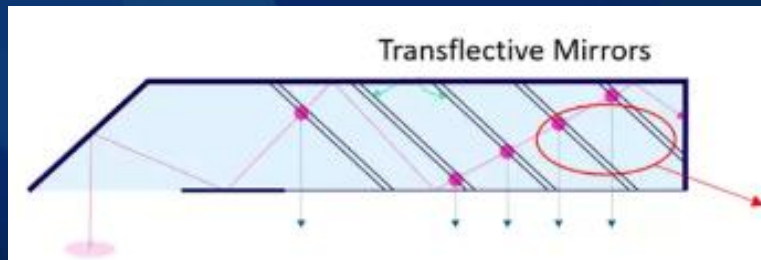
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Geometric Reflective Waveguides: high performance, low artefacts

2D Geometric Reflective Waveguides (GRWGs)

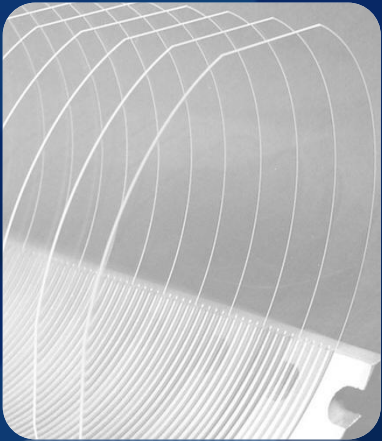


WG Performance

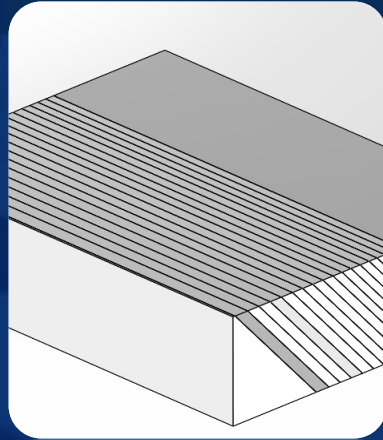
 Brightness	High efficiency
 Image quality	High uniformity, contrast
 World glow	Minimal forward leakage
Conspicuity	Minimal visibility of facets



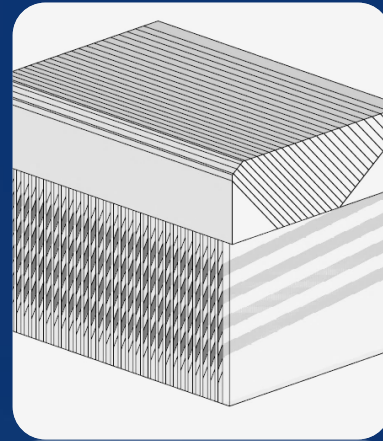
GRWGs **scalable in being made from large building blocks** that to be singulated into individual waveguides



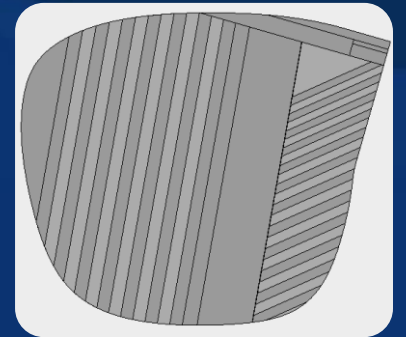
Substrates



Building Blocks



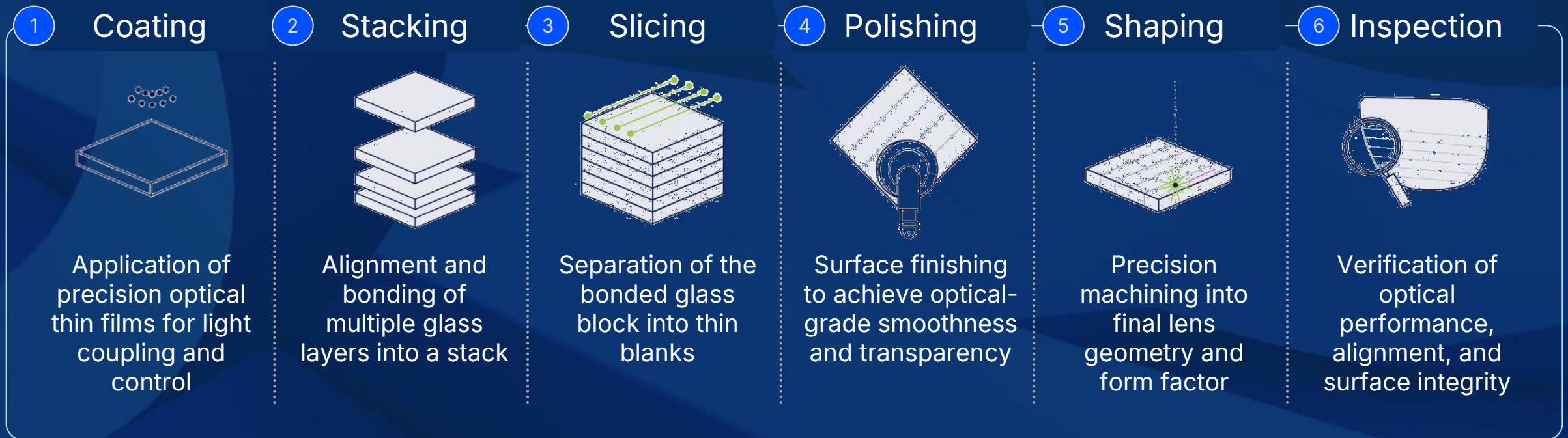
Mother Block / Macron



Waveguide



Geometric Reflective Waveguides: manufactured by conventional but high precision optical processing



SCHOTT has developed **unique** GRWG mass production **capabilities**

Volume Production

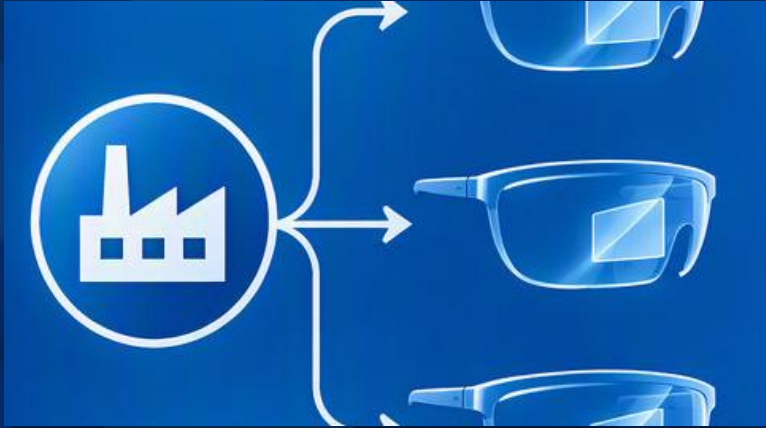
- New site in Malaysia
 - 18,000 m²
 - 40% Cleanroom, 60% Greyroom
- Timeline
 - Opening Sep 2024
 - Ramp in Q1/2025
 - 2.5X expansion within 12 months
 - 2nd line in 2027

Engineering

- Development & Pilot Fabrication
 - Malaysia: 2 engineering lines
- Global R&D network
 - SCHOTT: Germany, Switzerland, China, Malaysia, US
 - Partnering with Lumus



Your key questions on Reflectives?



- Is **only SCHOTT** supplying Reflectives Waveguides?



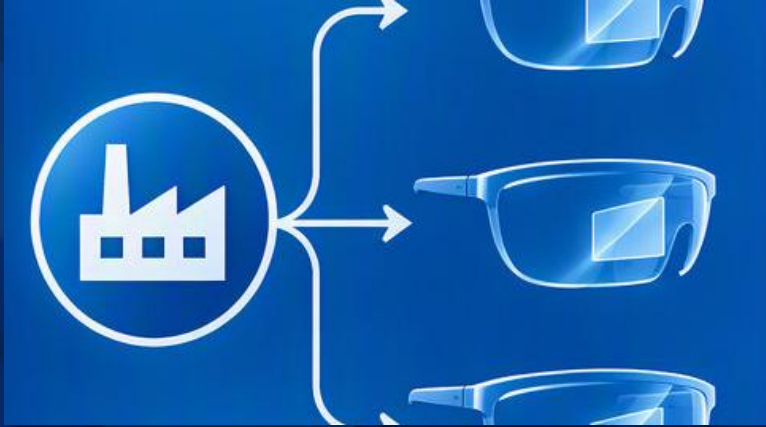
- Can this technology at all be manufactured with high **yield**?



- Can it be **scaled** to millions of devices and can it meet consumer **price** point?



Your key questions on Reflectives?



▪ Is **only SCHOTT** supplying Reflectives Waveguides?



Can this technology at all be manufactured with high yield?



Can it be scaled to millions of devices and can it meet consumer price point?



Reflective Waveguide **ecosystem** is growing and maturing

Lumus' IP platform



Waveguide Architectures @ SCHOTT

Z-Lens

A-Lens

Z2.0

ZOE

SCHOTT Products

Off-The-Shelf

Z50, Z30^[2.0], A30, ZOE70

Customized

to customer spec



Reflective Waveguide **ecosystem** is growing and maturing

Our waveguide architectures



Waveguide Architectures @ SCHOTT

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Reflective Waveguide **ecosystem** is growing and maturing

Our business offer



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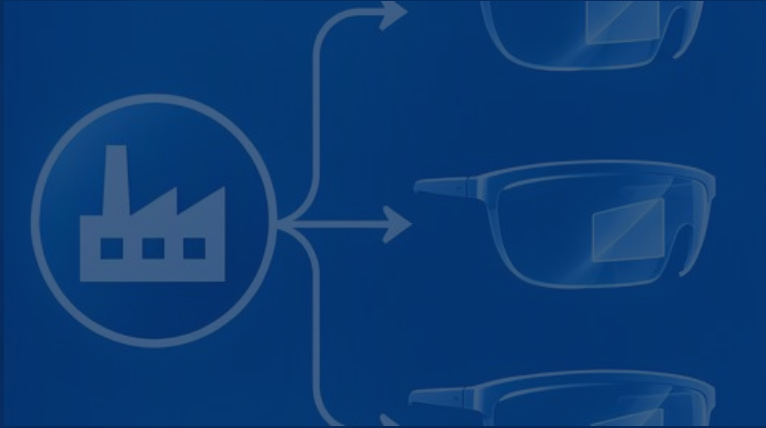
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Customized

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Yield compatible with mass production achieved

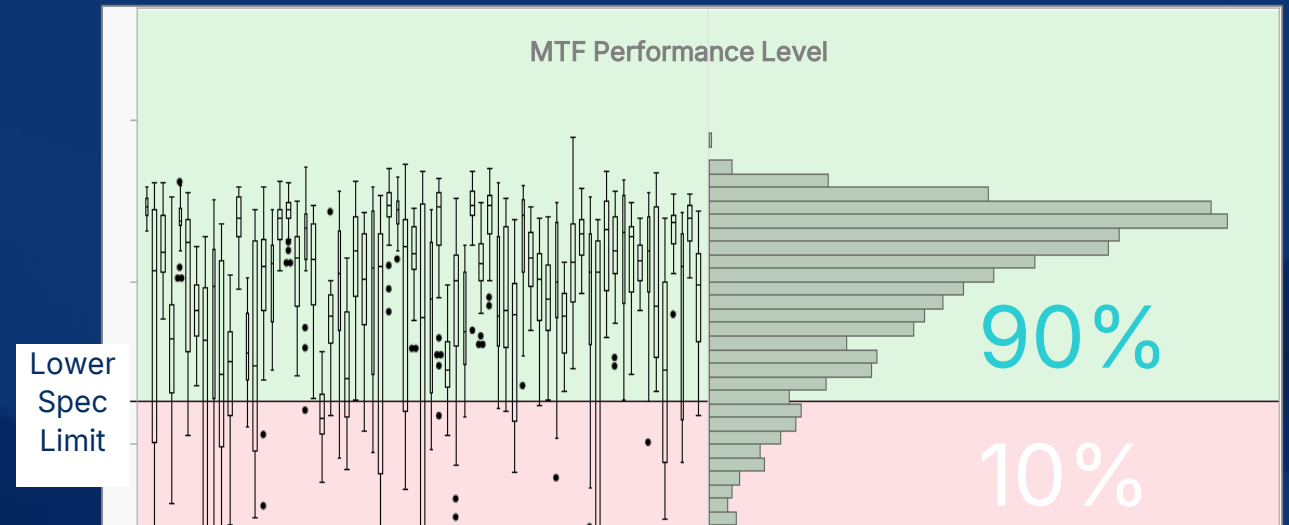
GRWG Manufacturability



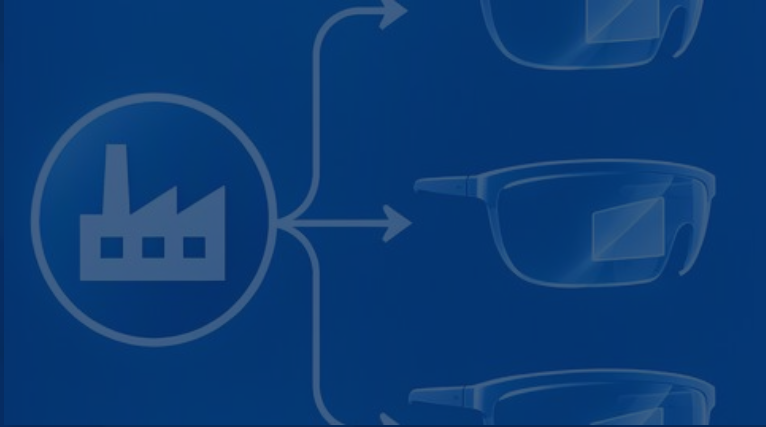
Manufacturing Quality

- **MTF** (image quality) at **90%** yield
- **All other** functional metrics at **>95%** yield

Production run chart and statistics MTF yield



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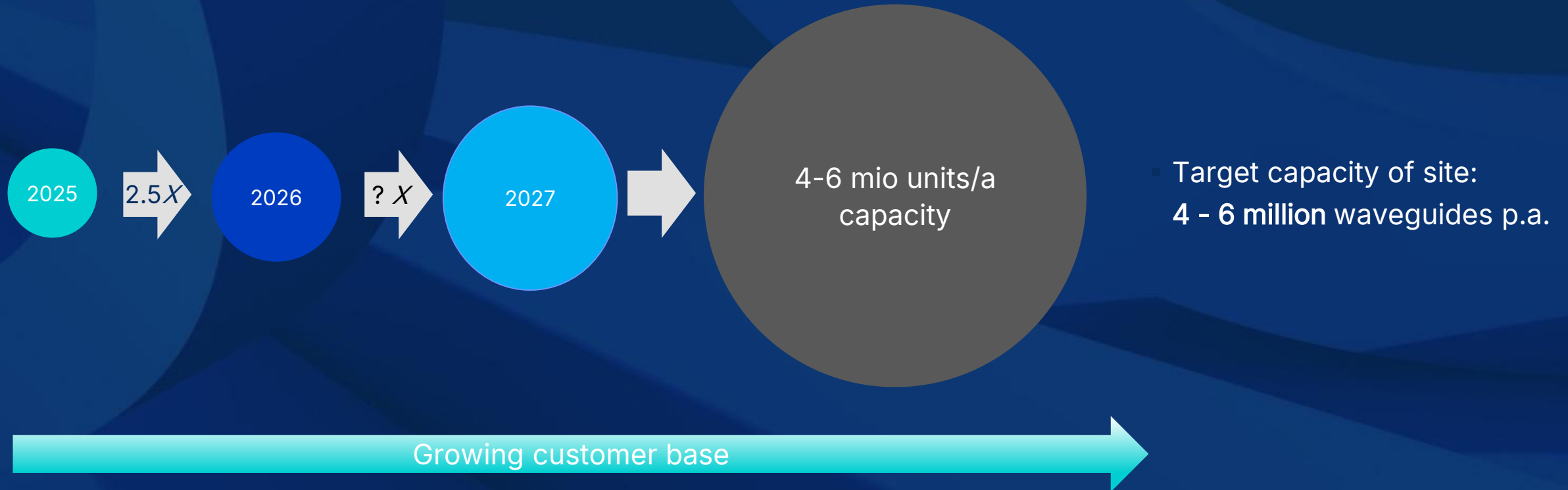


Can it be **scaled** to millions of devices and can it meet consumer **price** point?



Malaysia site designed for output of 4-6 million units p.a.

Production capacity



Cost down roadmap: TV Screen

1. Design to cost

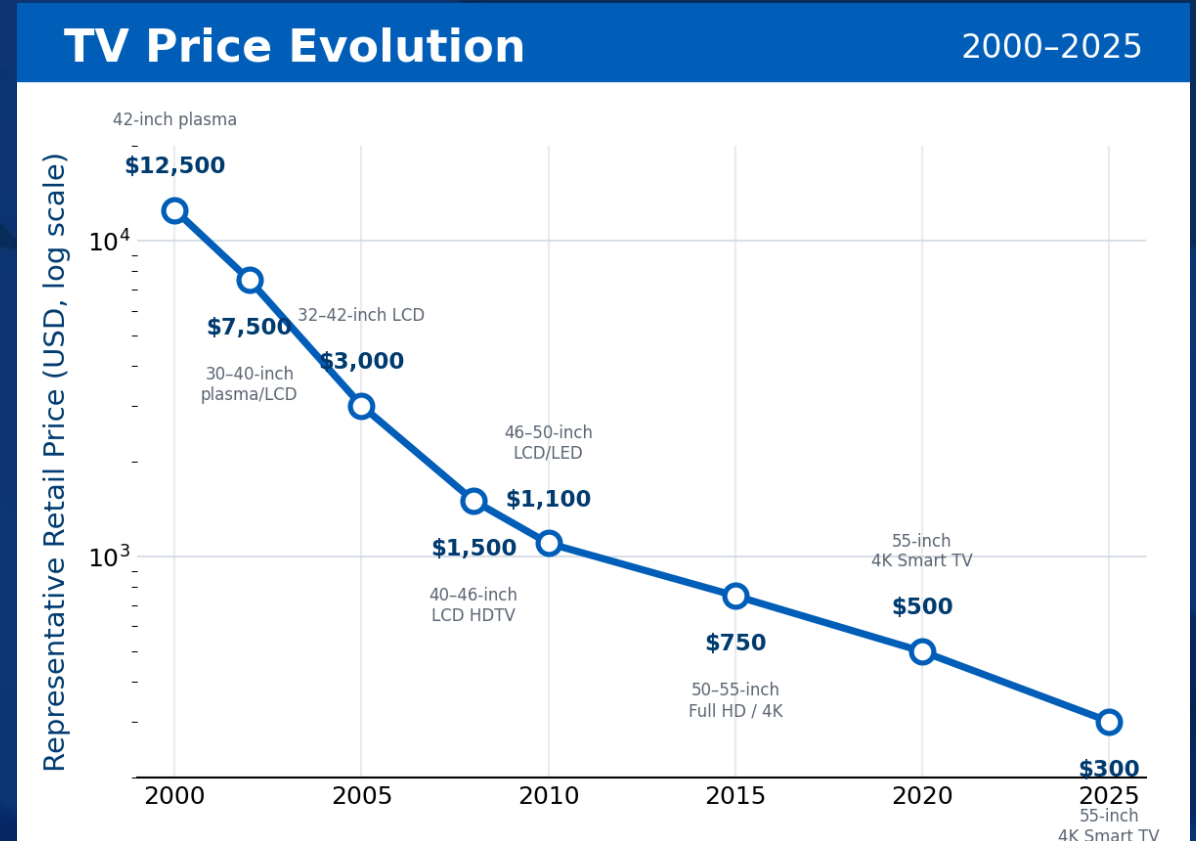
- (Optical) Design
- Design for Manufacturing (DFM)

2. Productivity

- Yield
- Throughput
- Capital cost / CAPEX (substrate size)

3. Economy of scale

- Purchasing power
- Dilution of indirect cost



Cost down roadmap: 2026 $\Rightarrow$ 2030 $\Rightarrow$ 100\4\100

1. Design to cost

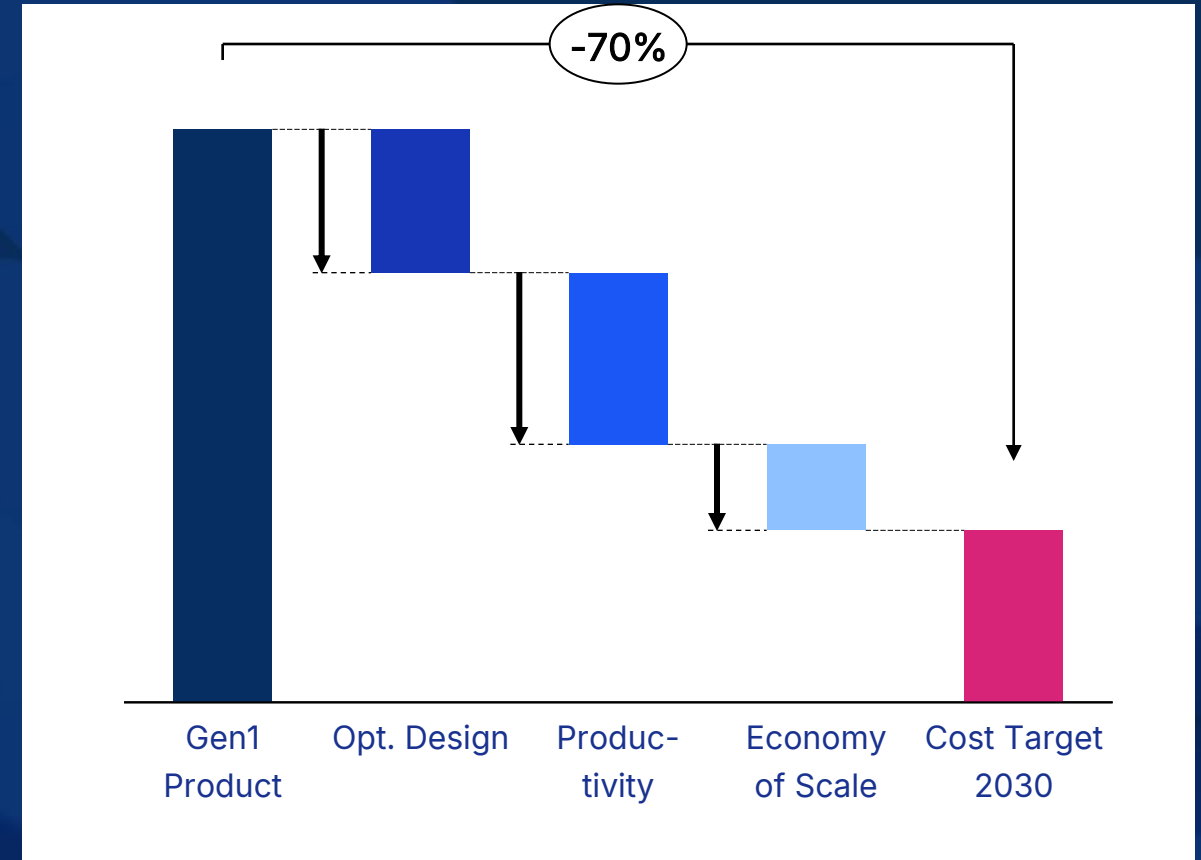
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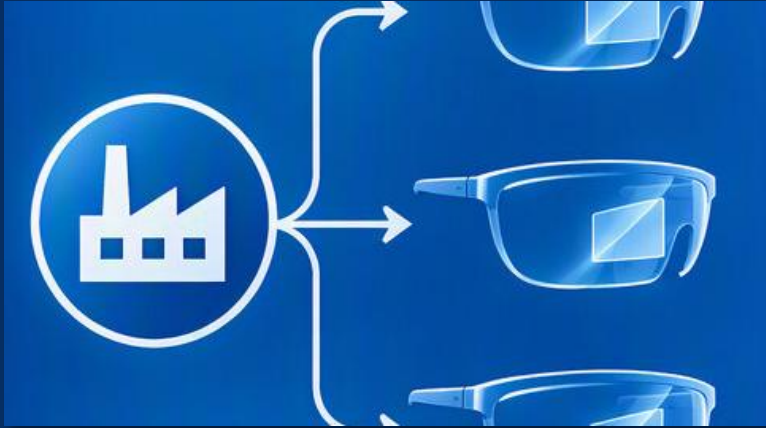
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Contact



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