

Optics in Security Features: New trends,  
Digital Add-ons, and Consumer  
Awareness

Your Innovation and  
Development Partner in  
Micro and Nanotechnologies

# Optics in Security Features

- High security:

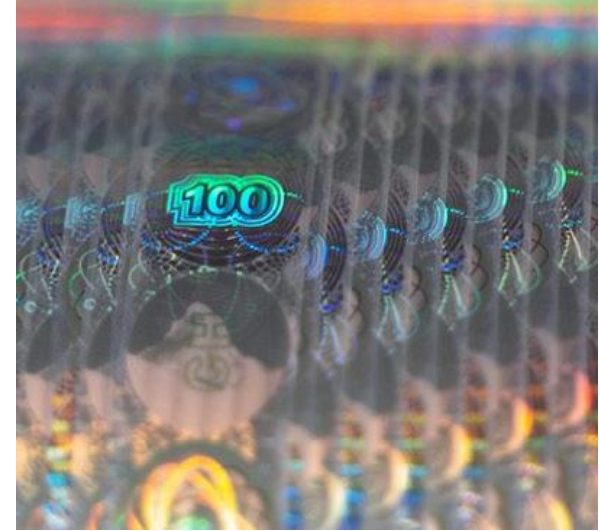
Banknotes, Passports, Tax Stamps

- Brand protection:

Labels

- Decorative Packaging:

Low level security



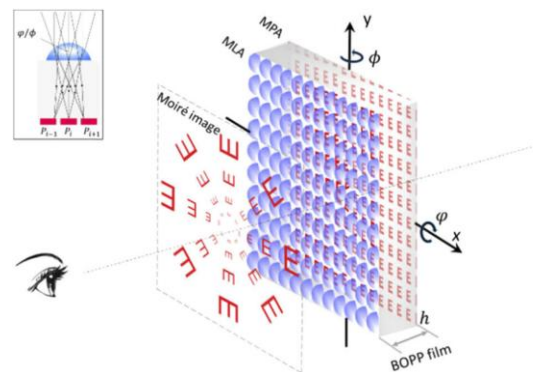
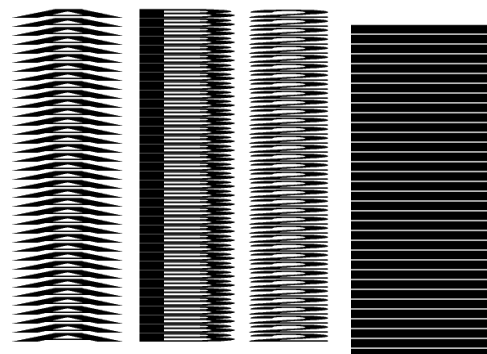
# What is new

- High security: Microoptics

Moire magnifiers, Micromirrors, Microprisms, Caustics, ...

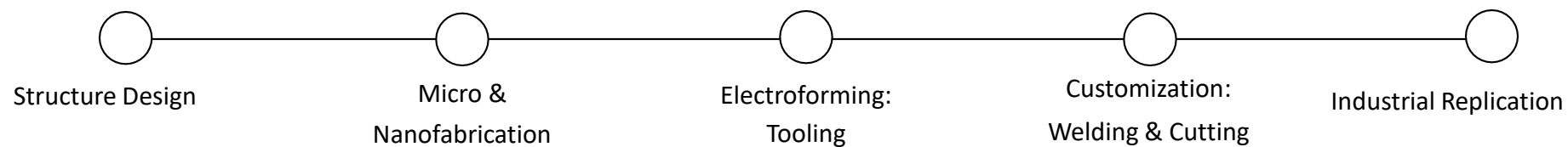
- Brand protection: Digitalisation

QR code on the label, Track&Trace, Blockchain integration

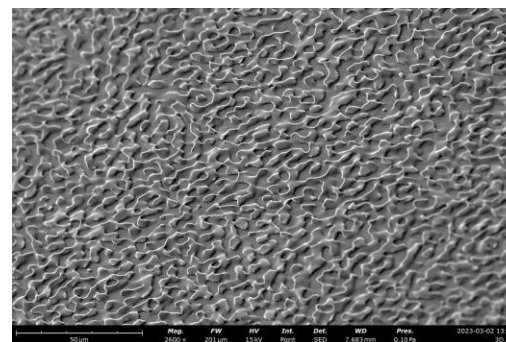


Jiang Yu, Weiwei Zheng, Nan Liu, Yun Zhou, and Su Shen, "Dynamic effect in the moiré magnifier by using the weak domain transformation," Opt. Express 28, 11065-11073 (2020)

## Process & Manufacturing Steps



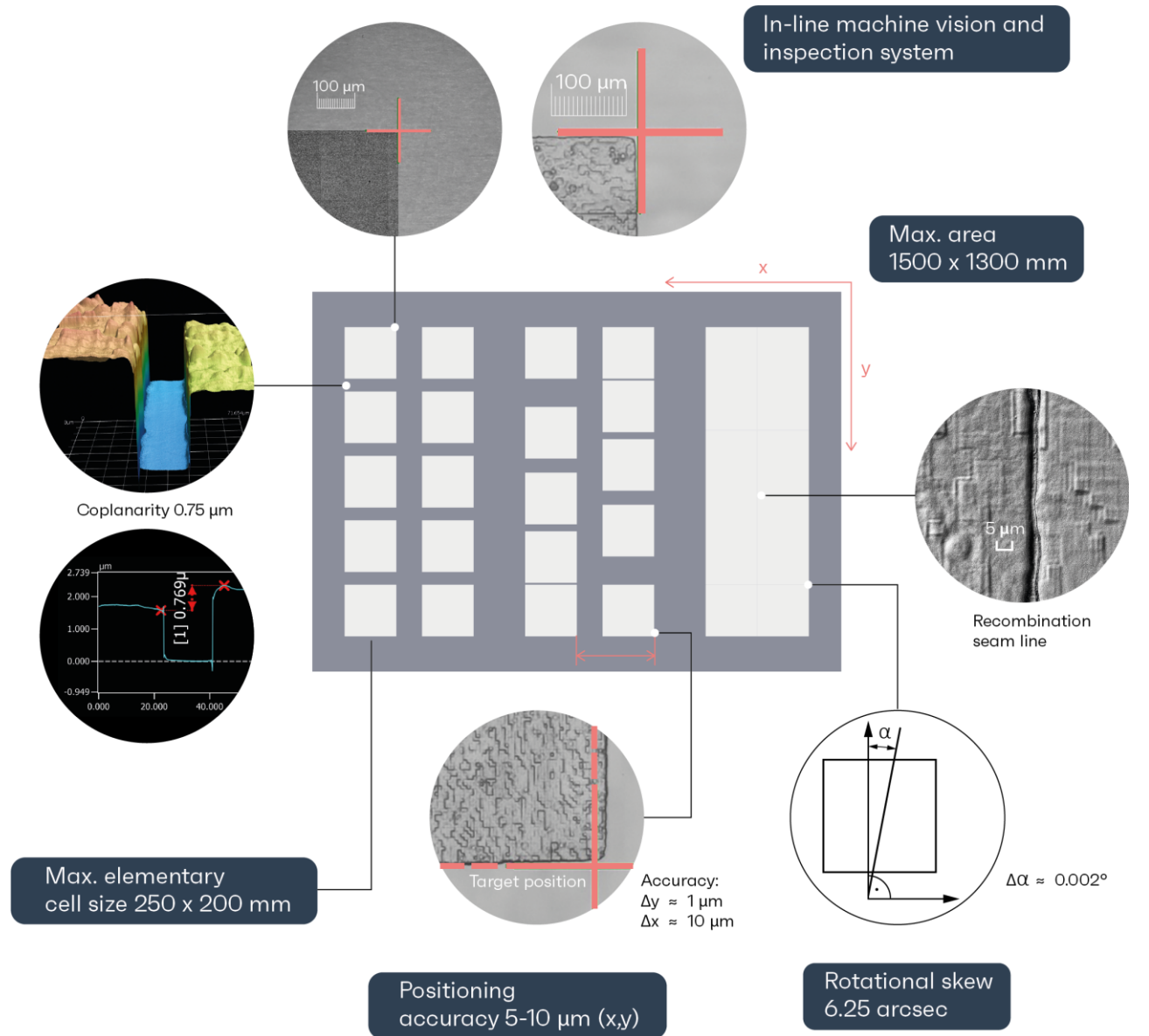
- 300 nm resolution
- nano – micro up to 50µm
- size up to 200mm x 200mm
- freeform



# UV Step & Repeat

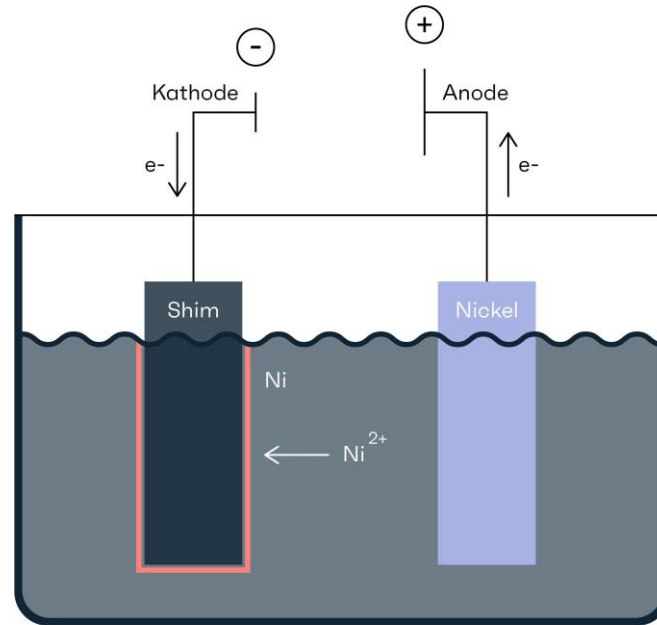
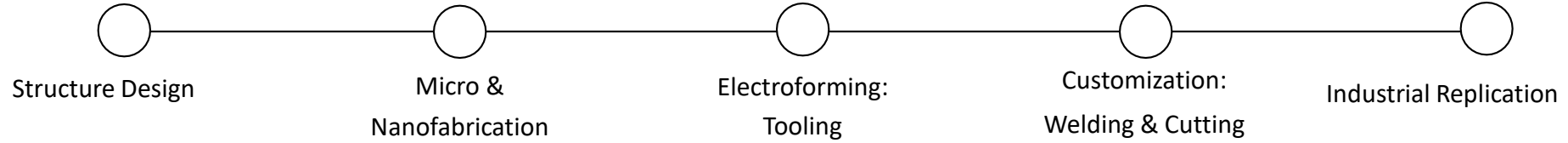
## UV Nanoimprint Lithography

- Maximal elementary cell 250mm x 200mm
- Machine positioning accuracy 5 $\mu$ m – 10 $\mu$ m
- Coplanarity 0.75 $\mu$ m
- Rotational skew 6.25arcsec
- In-line machine vision and inspection system
- Recombination seam lines down to 5 $\mu$ m
- Maximum size 1300mm x 1500mm



# From Lab to Industry

## Upscaling Partner: Process & Manufacturing Steps

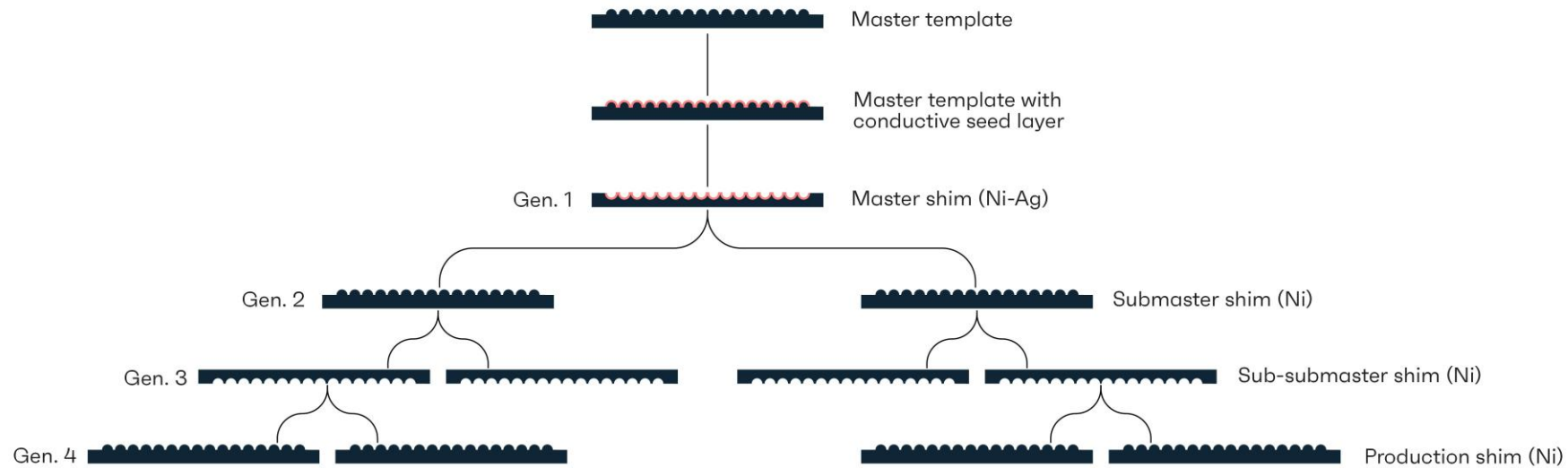
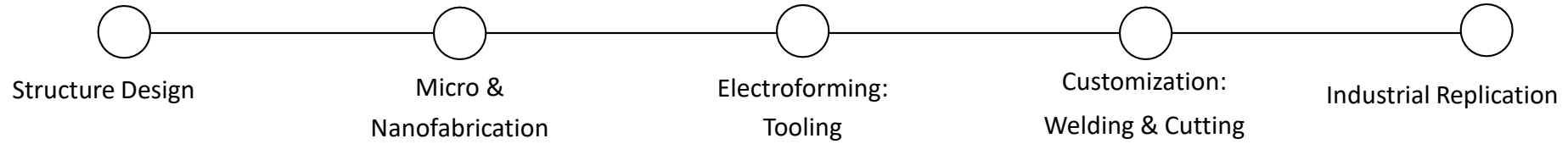


- Five custom built galvanic baths
- Size up to 1500 mm x 1700 mm
- Thickness range from  $\mu\text{m}$  – cm
- Total thickness variations 5 %
- Process with high structure fidelity
- Cost effective



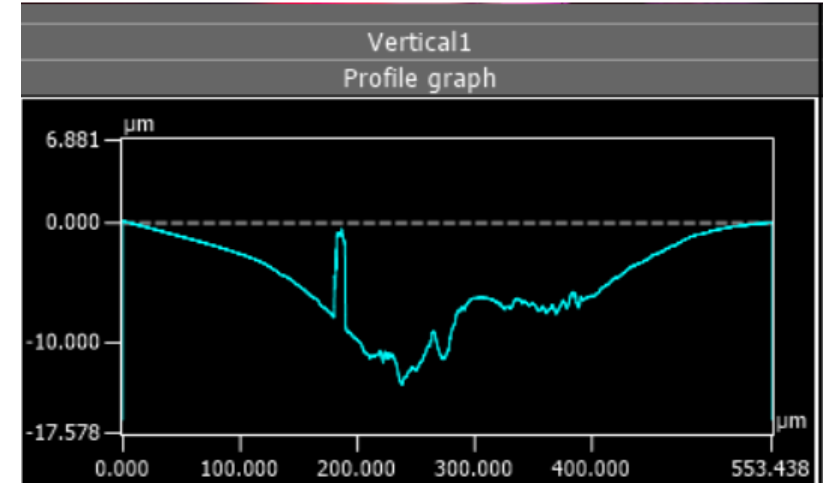
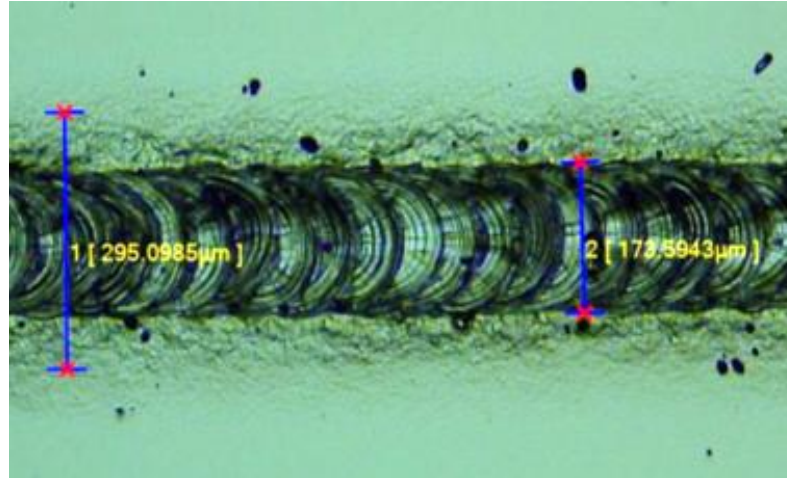
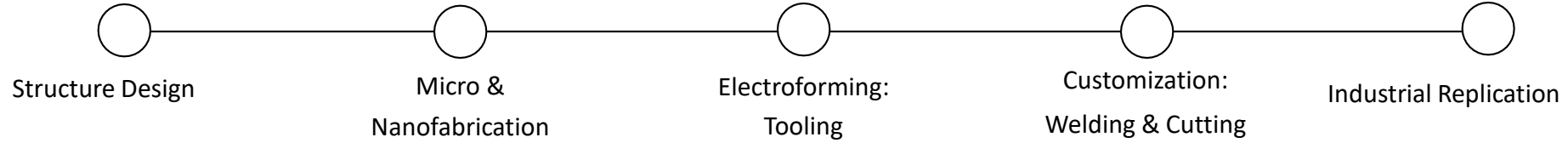
# From Lab to Industry

## Upscaling Partner: Process & Manufacturing Steps



# Customization

## Upscaling Partner: Process & Manufacturing Steps

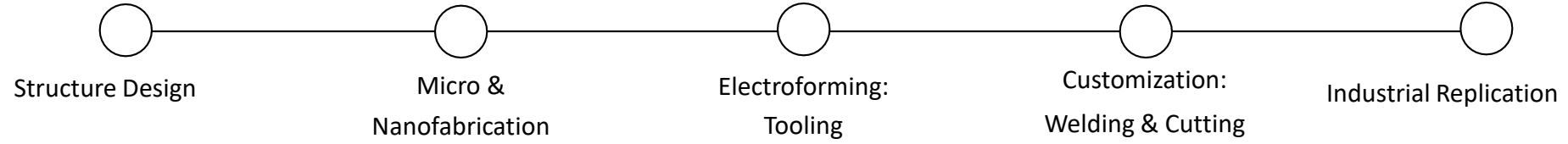


- Welding seam: 120 µm - 200 µm wide (thickness related)
- Alignment: +/- 10 µm
- Seam roughness: 3 µm – 5 µm
- Maximum size: 2000 mm x 2000 mm



# Industrial Replication

## Roll to Roll



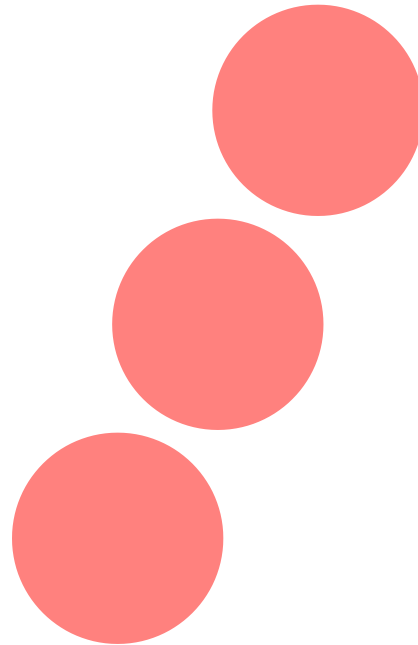
Sleeve for Mass Replication



R2R - UV Embossed Film



# About Us

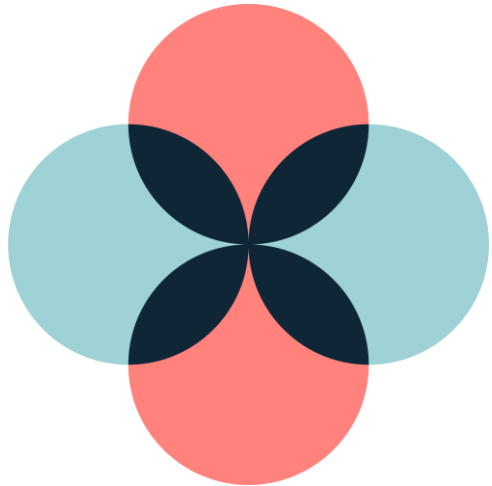


Founded 1989  
Based in Baar, Switzerland

2800 sqm building  
300 sqm clean room (ISO 5 - 7)  
+40 specialized machines  
Enabling net-zero manufacturing

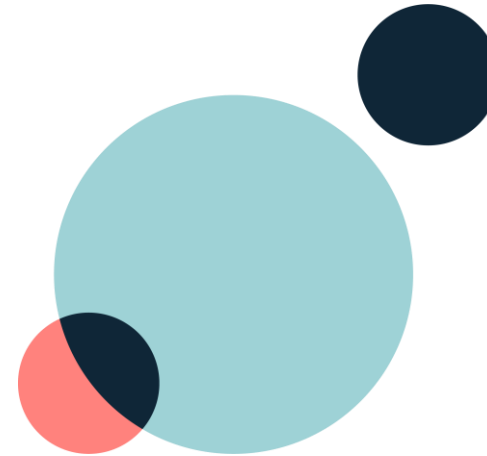
**We are:** Future focused, sustainable,  
transparent & human

# Our Two Worlds



## Brandbuilding & Security Partner

High-security, digitalization and consumer engagement solutions tailored for brands and governments.



## Micro & Nano Lab

Your innovation and development partner in micro and nano technologies.

# Do you have any questions?

# Get in touch!

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# Thank You!

**3D:AG**

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