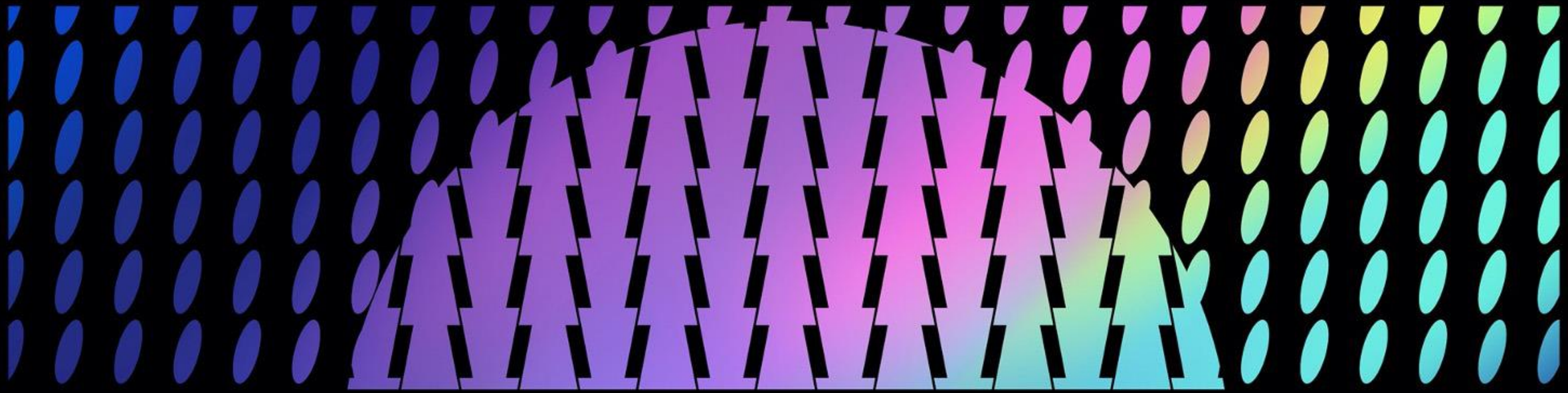
micro-precision parts reimagined

we take the creation of micro-precision parts to unprecedented levels

Nicolas Hildenbrand – 20.06.2023



world leader in micro-precision

Tech Talk outline

- Veco Precision in a nutshell
- Electroforming: how does it work?
- Key advantages and Disadvantages
- Examples

the Muon Group, part of Idex Corp.

operating companies

Eerbeek

veco

Veco has been electroforming since 1934. It is an additive manufacturing process for precision metal parts. Its uniqueness is that it can grow metal parts atom by atom, providing extreme accuracy and high aspect ratios.

Veco serves the world's most innovative high-tech industries that demand precision components in industrial volumes.

Weymouth

tecan

Tecan has been pioneering the use of photo chemical machining (etching) since 1970. Etching is an innovative, photolithography-based process that was developed as an off-shoot from the manufacture of printed circuit boards.

Tecan attracts customers who appreciate the advantages of etching over more conventional manufacturing methods such as stamping.

Wijchen

millux

Millux, formerly known as Reith Laser, was founded in 1988, when laser machining was still a relatively unknown technology. Today, modern laser technology offers great advantages in comparison with traditional material processing techniques.

Meanwhile, Millux has developed into a capable and trusted supplier for the high-tech industry, offering a range of laser micro-machining applications.

Pune

atul

Atul is currently a sales office whose main function is to provide technical and sales support to sugar sieve customers in India and neighbouring countries.

Hapert

LouwersHanique

LouwersHanique joined Muon in 2021 and builds on 70 years of innovation, experience and tradition.

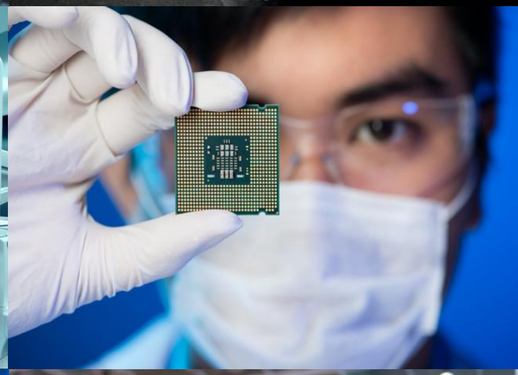
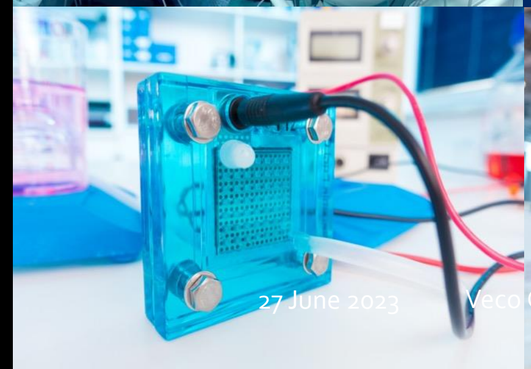
LouwersHanique is trusted by some of the world's leading high-tech companies to be their solutions provider of choice when it comes to extreme accuracy challenges in respect of technical glass, advanced ceramics and special material combinations.

empowering the next industry breakthrough

markets we drive innovation for on a daily basis

- Aerospace & Defence
- Automotive
- Electronics & Semiconductor
- Industrial Automation
- Digital Printing
- Filtration
- Medical & Life Sciences
- Green Energy



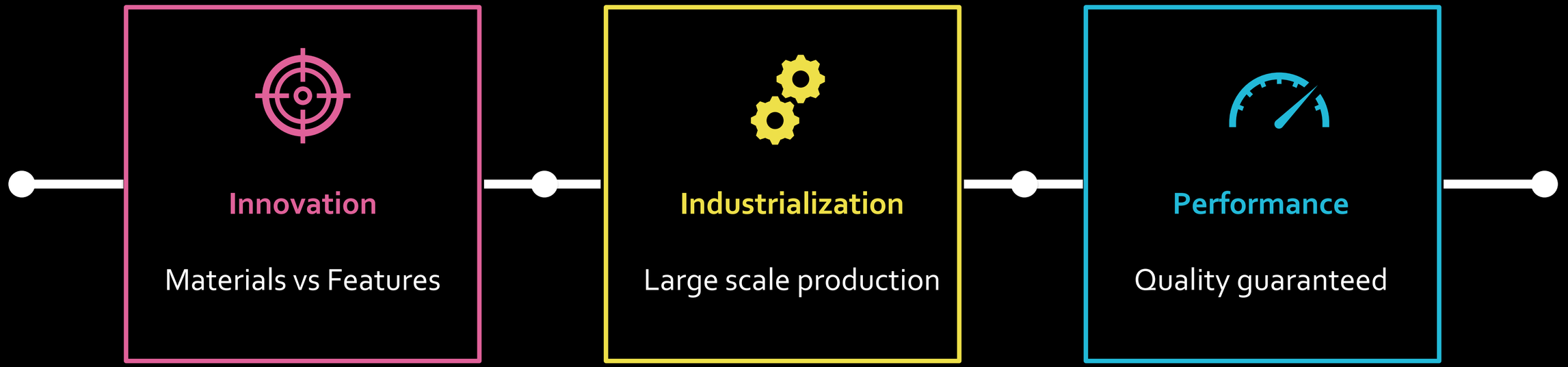





new products keep getting smaller

Customers need industrial, cost-effective fabrication of micro-precision parts to further drive the miniaturization of their products.

what we have to offer

we take the creation of micro-precision parts to unprecedented levels



Electroforming capabilities

Product maximum size	150 x 150 cm	50 x 60 cm	30 x 30 cm
Tolerances	~10 µm	~ 3 µm	< 1 µm
Min. feature size	50 µm	20 µm	1,5 µm
Typical product thickness	8 – 1200 µm	25 – 800 µm	5- 100 µm

Materials: Nickel, Palladium alloy, Gold, Copper, Rhodium, Anti reflective Black

Key Advantages and Disadvantages

+ High accuracy demand in combination with high volumes

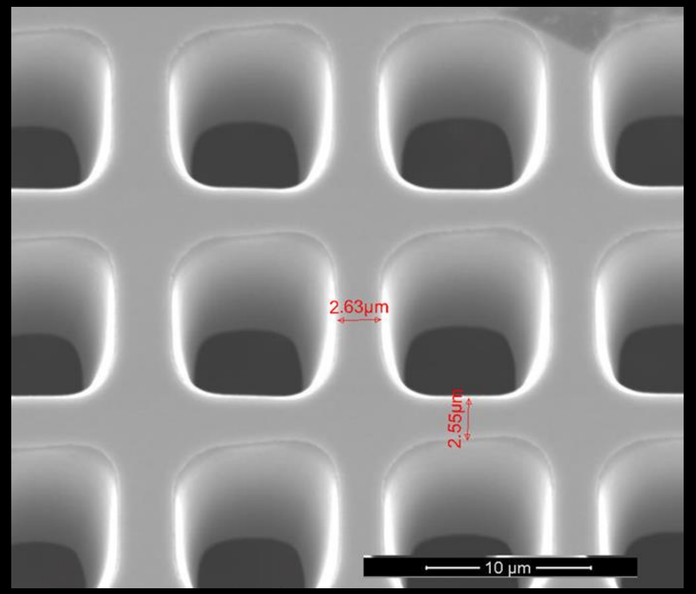
+ Perfect replicability from proto to mass production

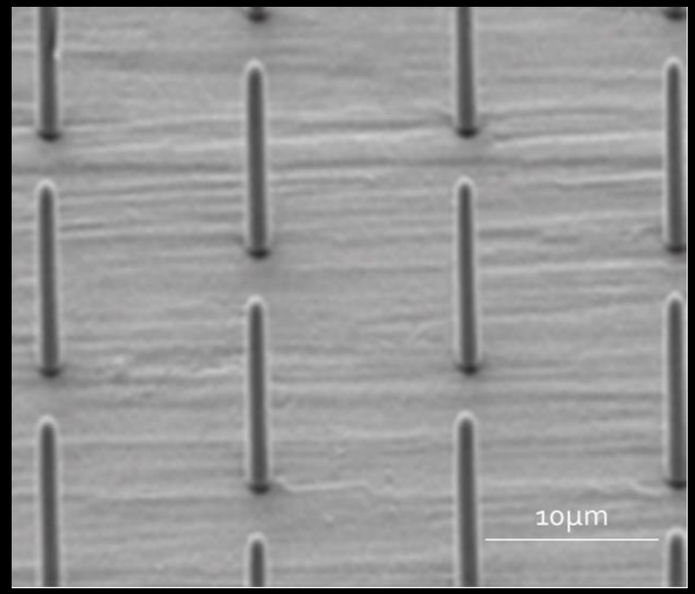
+ Mono and multiplayer structures are possible

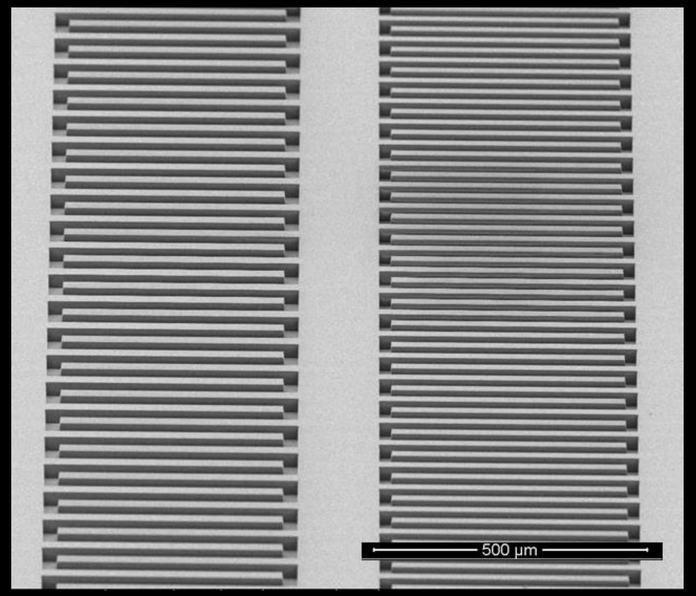
+ Freedom of design and easy design change

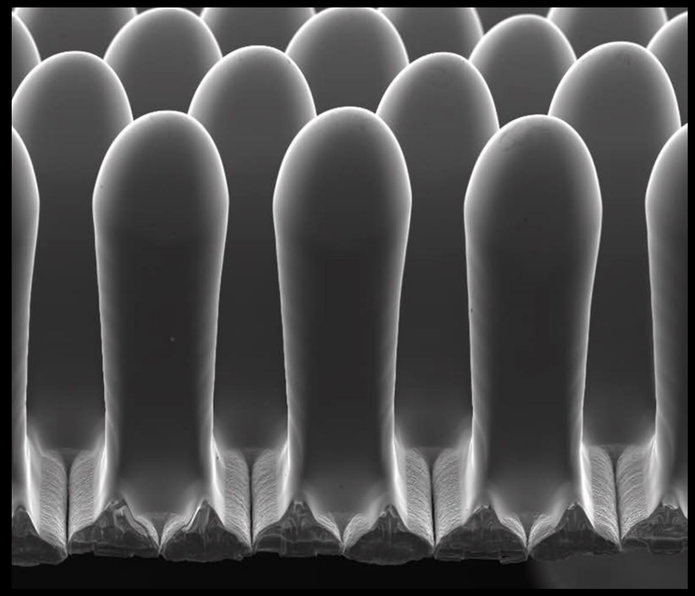
- Limited 3D capability

- Limited number of metals
  Nickel, Palladium alloys, Copper,
  Rhodium, Antireflective Black, Gold









veco

Material properties

Property	Type					Comparison Stainless Steel[2]	
	Veco84	Sulfamate	Meta	HR-Ni	PdNi	SS 316L	SS 304
Tensile strength R_m [MPa][1]	2200-2300	550-570	1060-1080	1670-1690	1750-1950	680-710	680-710
Yield strength $R_{p0.2}$ [MPa][1]	1900-2100	390-405	760-785	1100-1300	1700-1750	290-330	290-330
Elasticity E [GPa][1]	130-135	80-95	80-95	90-125	95-110	130-155	130-155
Elongation at failure [%][1]	4-7	13-20	6-7	2-8	0-2	50-55	65-75
Hardness HV [N/mm^2][3]	620-660	185-200	330-340	460-470	520-530	175-185	180-200
Saturation magnetization M_s [µA m^2 mg^{-1}][4]	52-56	52-56	52-56	52-56	n.a. (paramagnetic)		
Chemical Purity [wt% Ni][5]	99,5	99,9	99,9	99,9	alloy		
Nickel Leaching [mg/L][6]	0,056 +/- 0,008	0,072 +/- 0,014	0,053 +/- 0,036	0,075 +/- 0,028	0,025 +/- 0,016	0,000 +/- 0,000	0,000 +/- 0,000
Gloss type	High	Semi	High	High	High		
Gloss [%]	55% @ 20°	2% @ 60°	42% @ 20°	56% @ 20°	59% @ 20°		
Surface Roughness R_a [µm]	0.03	0.3	0.02	0.04	0.03		
Surface Roughness S_a [µm]	0.03	0.2	0.03	0.06	0.05		
HV ≥ 95% + R_m ≥ 95%[7]	120 °C	160 °C	200 °C	200 °C	200 °C		
Bulk resistivity ρ [x10^{-7} Ω.m][8]	1.3 ± 0.1	0.8 ± 0.1	0.9 ± 0.1	1.0 ± 0.1	2.9 ± 0.1		

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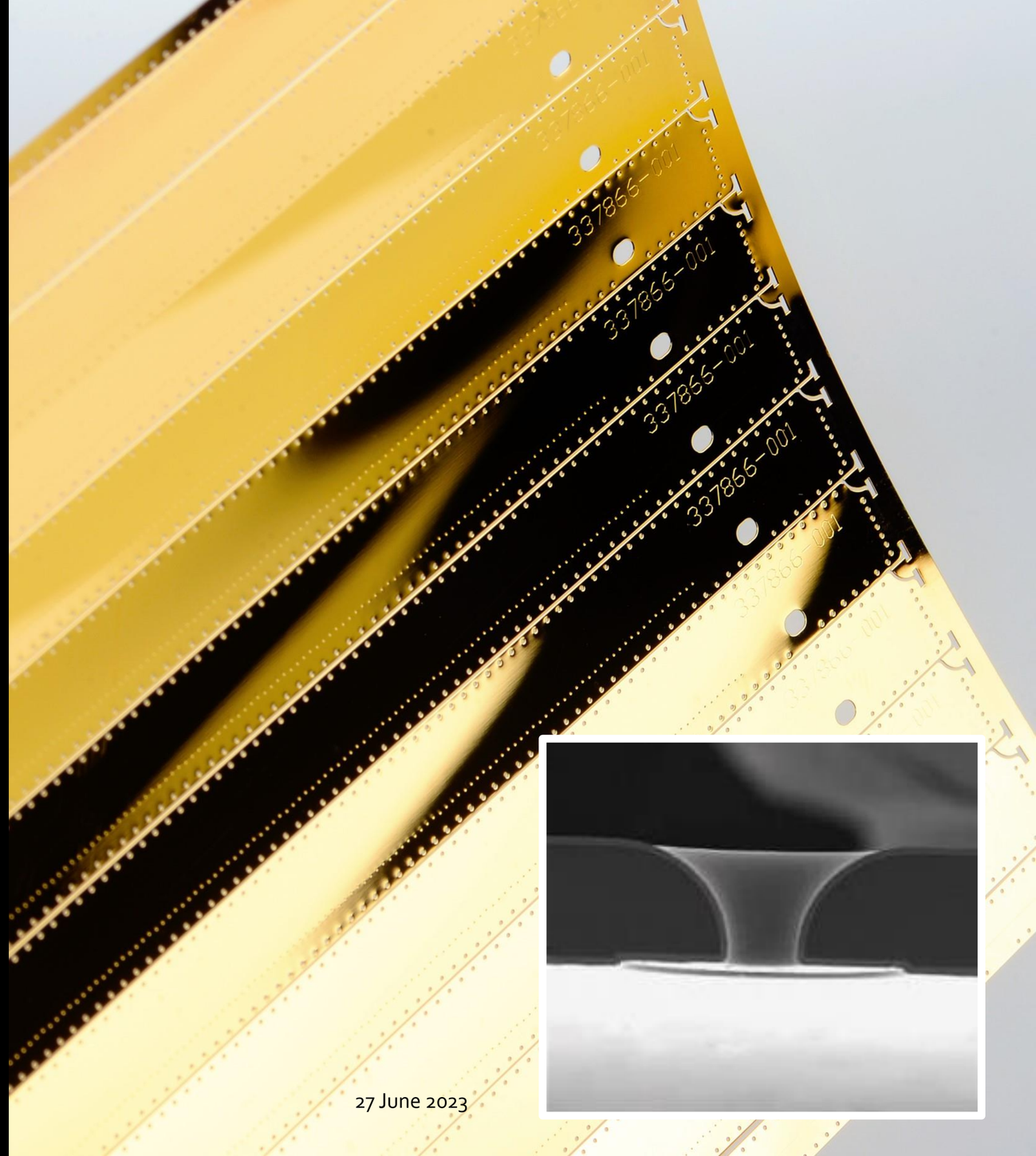
digital printing

inkjet nozzle plates

Key product features	Electroforming requirements
Unparalleled jetting performance	Perfect Hole shape
Ultra-precise hole geometry	Tolerance < 1 µm
Well controlled pitch accuracy	Tolerance < 0,15 ‰
Superior chemical stability	Gold coating
Superior mechanical stability	Nickel mechanical properties
Traceability of nozzle plates	Laser marking
Zero defect	Guaranteed



semiconductor

MEMS probes

MEMS probes are used to determine the performance of electrical devices like micro-electro-mechanical systems or electronic chips at the wafer level.

Key product features

Hard and wear resistant
High electrical conductivity
Excellent mechanical properties
Heat resistant probes
Stable low contact resistance

High dimensional accuracy

Solderable
Zero defect

Electroforming requirements

Rhodium material
Tailored Nickel material
Tailored Nickel tensile behaviour
Stability up to 300 °C
No oxidation / reaction to contact

Resolution & alignment < 1 um

Gold plating
Guaranteed

Thank you
for your attention

Contact:
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Visit us at booth 10