MICROMETAL

5th RD51 Collaboration meeting

Freiburg/Germany; 24th-27th of May 2010

High volume etching, a manufacturing method for GEMs

Michael Sillmann
Managing Director
MICROMETAL GmbH

Content of presentation

- **Opening Comments**
- **Key data and history of MICROMETAL**
- **Manufacturing process: high volume etching**
- **Capabilities and product applications**
- **GEM manufacturing**

Key Data

Markets	50% Europe, 50% NAFTA
Products	precision metal components photo chemically etched
Owner	Wickeder Westfalenstahl GmbH, Germany
Key figures	# of employees: 32 Annually manufd parts.: approx. 60 Mio.

Key Data

Area: 6.100 m²

eq. 20.000 sqft

Area for future expansion:

11.500 m²

eq. 38.800 sqft

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Key Data

Industries we supply to

- Electronics
- Filtration
- Chemical
- Consumer
- Decorative
- Regen. Energies
- Medical
- Automotive
- …
- …
- …
- ***Whatever one may think of!***

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History

1988 Start Up of original Production Line in joined project with IBM

****

1997 Capability for copper and copper alloys

****

2001 Exposure system w/ large exposure area & auto registration

****

2002 Development of R2R product

****

2003 Automatic inspection for R2R parts

****

2005 Separation from BMC Industries, start as MicroMetal GmbH

****

2006/7 Complete separation from historic infrastructure

****

2007 TS 16949 Certification

****

2009 Release for manufacturing of parts acc. GMP guidelines
Customer project: FDA phase I and II clinical trials

****

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Key Data

Wickeder Westfalenstahl GmbH
Wickede (Ruhr), Germany
some 420 employees
> € 300 M turnover in 2008
Leading market position for clad materials and cold rolled steel strip

100%

MICROMETAL GmbH
Muellheim, Germany
30+ employees

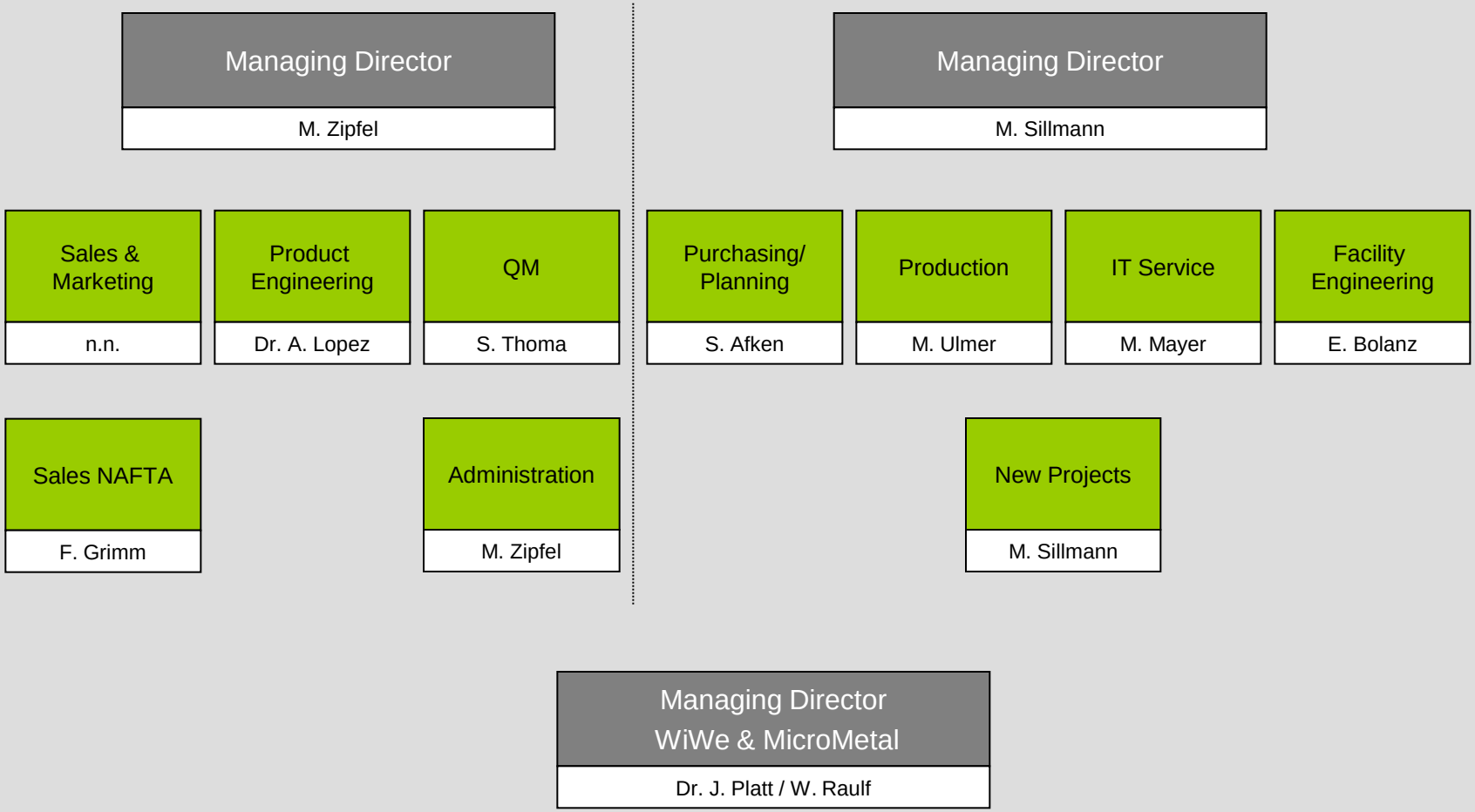
100%

EMS Inc.
Attleboro, MA, USA
some 380 employees

100%

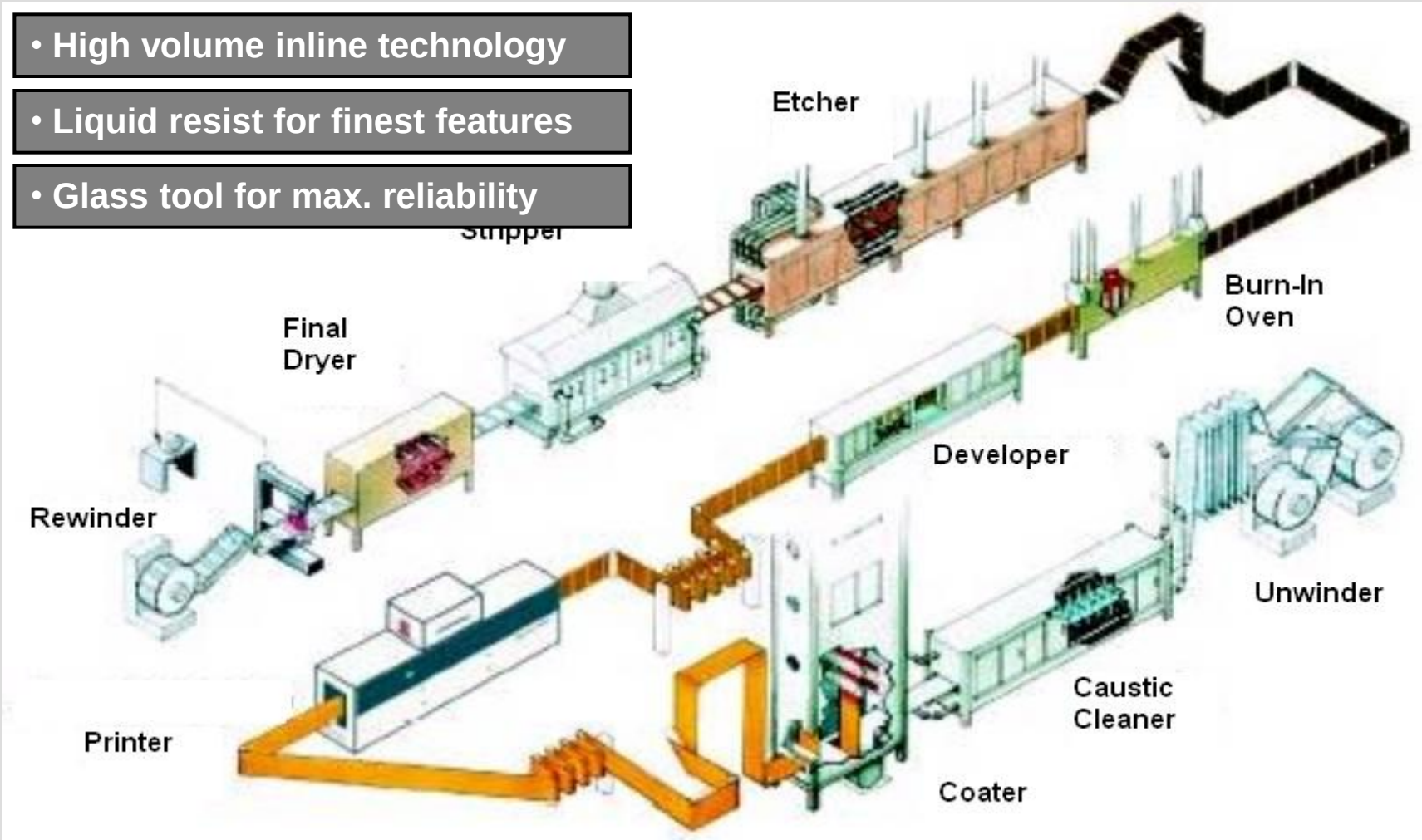
Wickeder Steel Company
Pleasant Prairie, WI, USA
some 50 employees

Key Data


Managing Director
M. Zipfel
Managing Director
M. Sillmann
Sales & Marketing
n.n.
Product Engineering
Dr. A. Lopez
QM
S. Thoma
Purchasing/ Planning
S. Afken
Production
M. Ulmer
IT Service
M. Mayer
Facility Engineering
E. Bolanz
Sales NAFTA
F. Grimm
Administration
M. Zipfel
New Projects
M. Sillmann
Managing Director WiWe & MicroMetal
Dr. J. Platt / W. Raulf

Manufacturing Process

- High volume inline technology
- Liquid resist for finest features
- Glass tool for max. reliability



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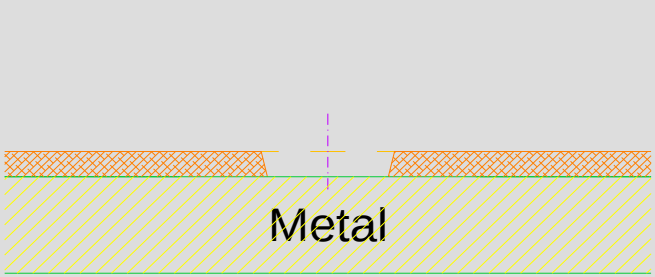
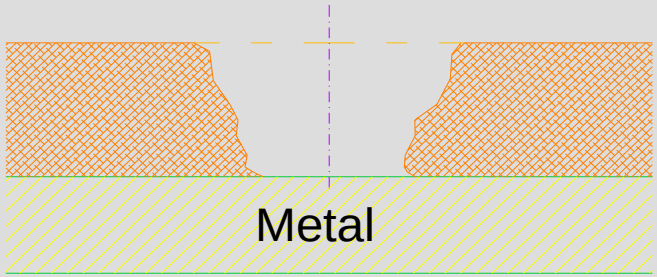
Manufacturing Process - Coating



Liquid Resist

vs.



Dry Film

- Considerably thinner photo resist (2-8 µm)
- Better adhesion between substrate surface and photo resist
- high volume precision parts in an endless process
- Easier removability
- Higher resolution (down to 10 µm)

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Manufacturing Process - Tooling

Laser-plotted glass photo tools vs. film tools

- Higher Precision and resolution (+/- 0,5 µm)
- Better dimensional stability (CTE_{Glas}: 7.6 x 10^{-6}/K)
- “Independent” of storage conditions
- Higher repeatability
- Registration (top- to bottom: +/- 3 µm)

Manufacturing Process

Therefore we do have strong competitive advantages …

- processing thin materials

- with ultra fine structures

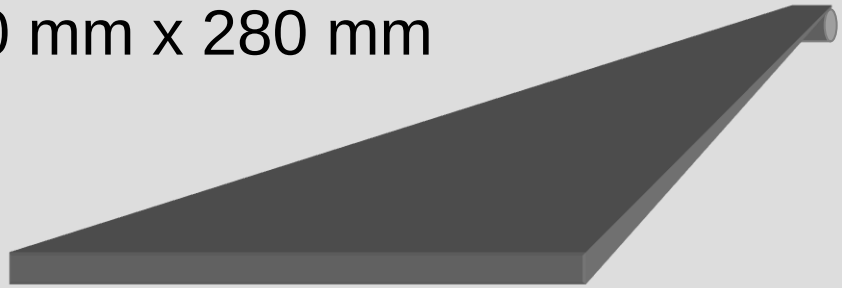
- requiring tight tolerances

- in very high volumes

This even more so, when reel-to-reel capabilities are needed (endless strips).

Features

- dimensions
  - strip thickness: 25 µm – 350 µm
  - strip width: 100 mm – 330 mm
  - max. part dimensions: 760 mm x 280 mm



- minimum hole size = 80% of strip thickness
  aspect ratio = 1.25

  e.g. 20µm hole diameter in a web of 25 µm thickness

Materials

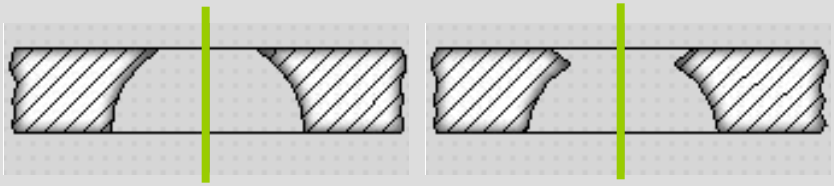
We process …

- standard and stainless steel
- FeNi alloys (e.g. Invar 36, 42 and 52)
- aluminum and aluminum alloys
- copper and copper alloys (e.g. bronze, brass, copper beryllium)
- metal-film laminates
- clad materials (bonded metal)

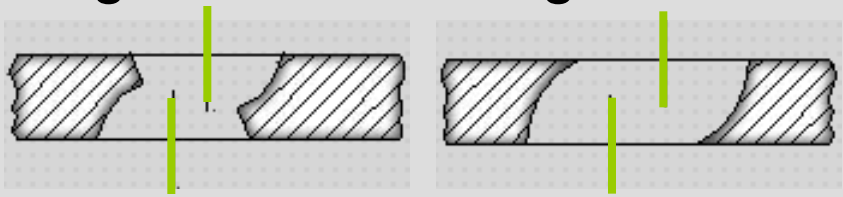
More materials are available on demand.

Technology

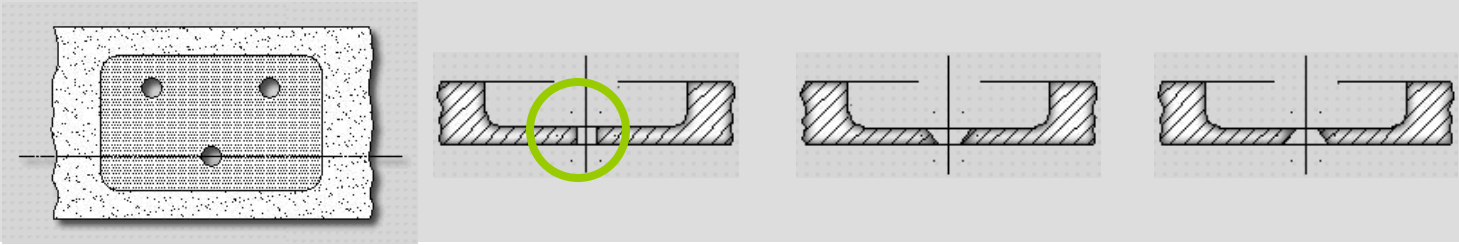
- Possible cross section shapes by photo chemical machining
  - Symmetrical hole



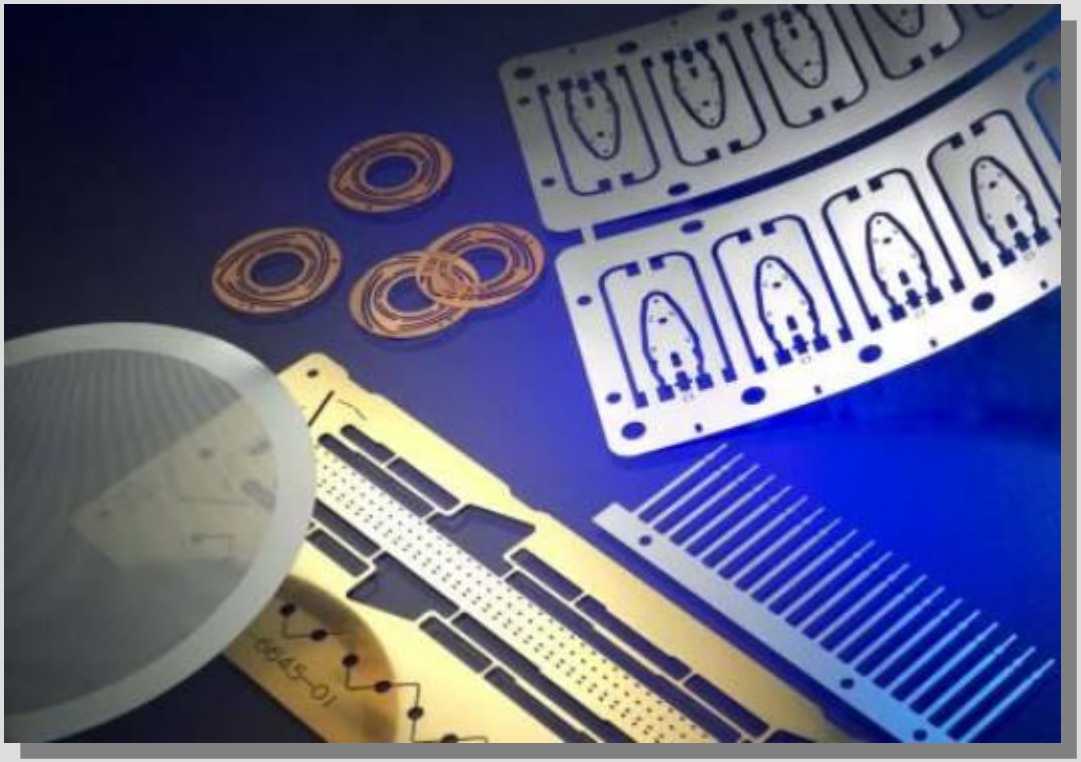
  - Defined positioning of break through locations



  - Combining of depth and break through etching



Products



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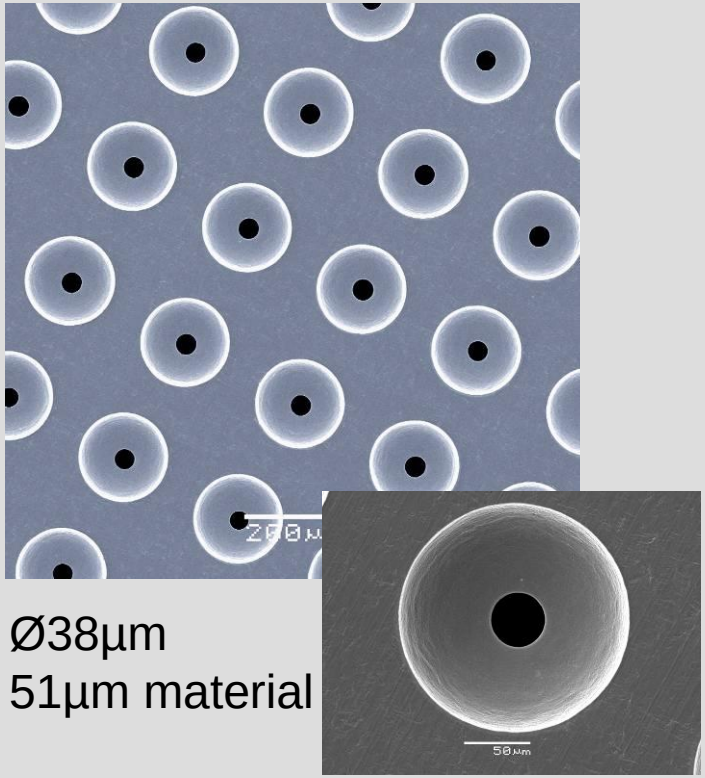
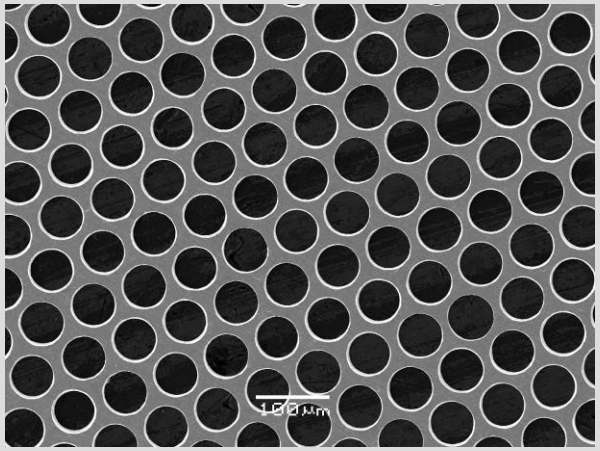
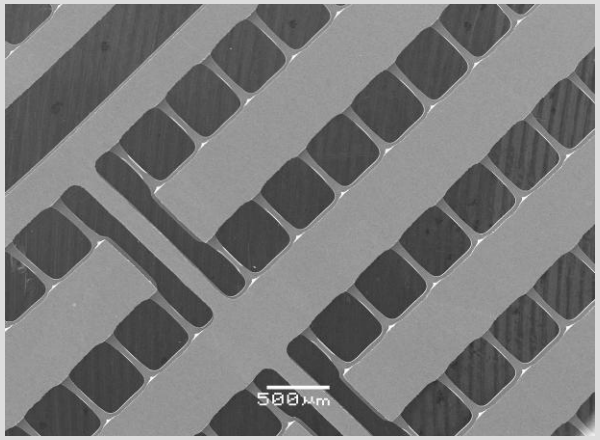
Features



Ø38µm
51µm material



Ø55µm
40µm material



50µm filaments
105µm clad material

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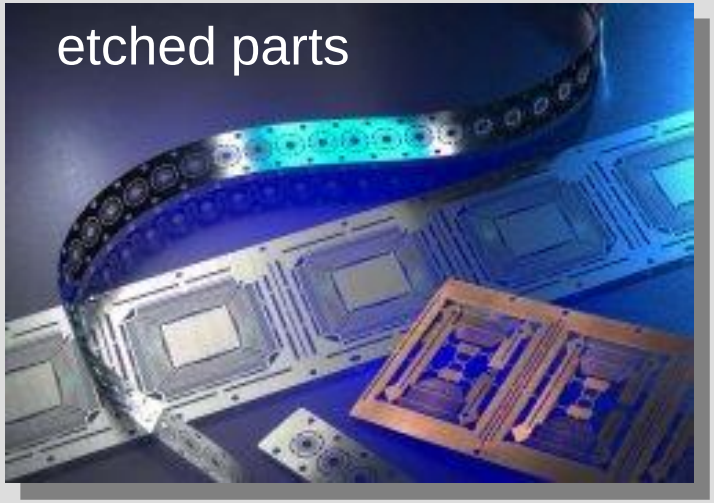
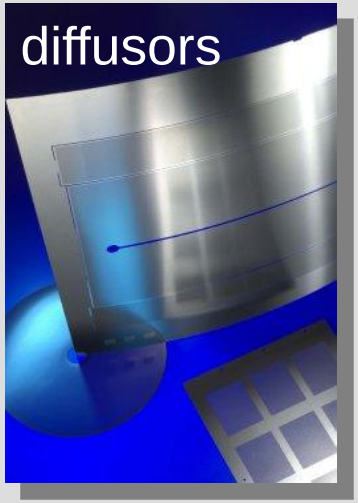
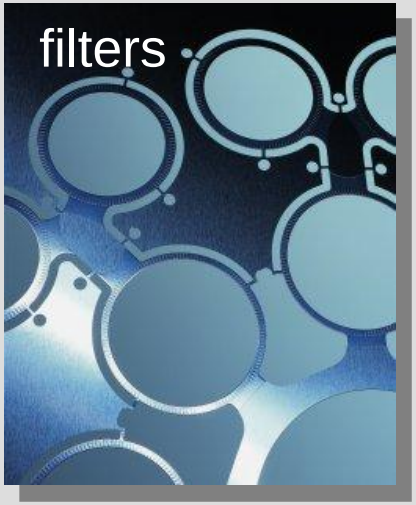
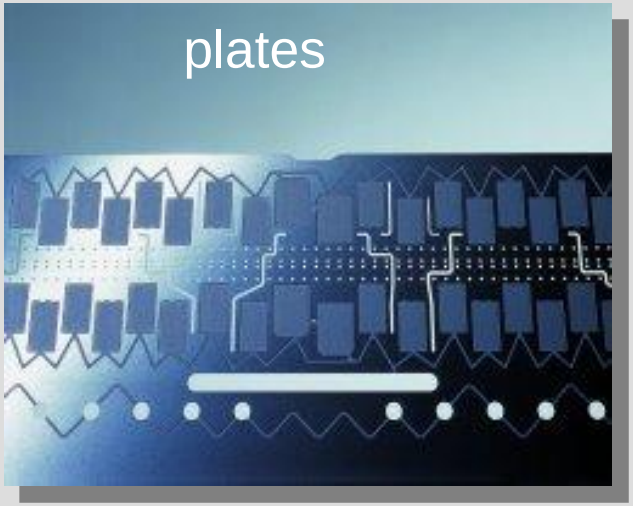
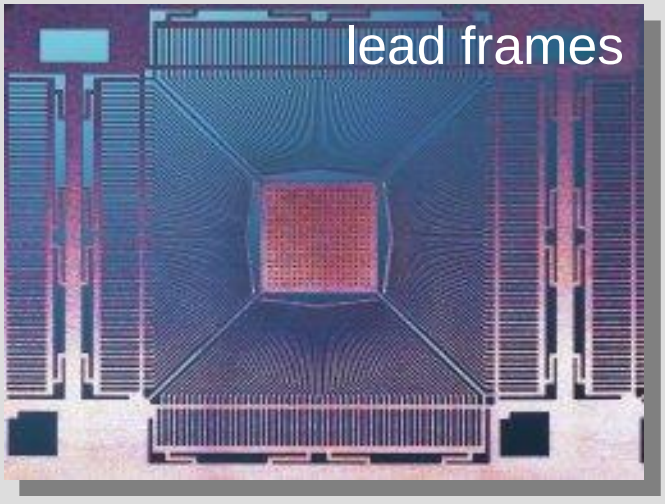
Applications











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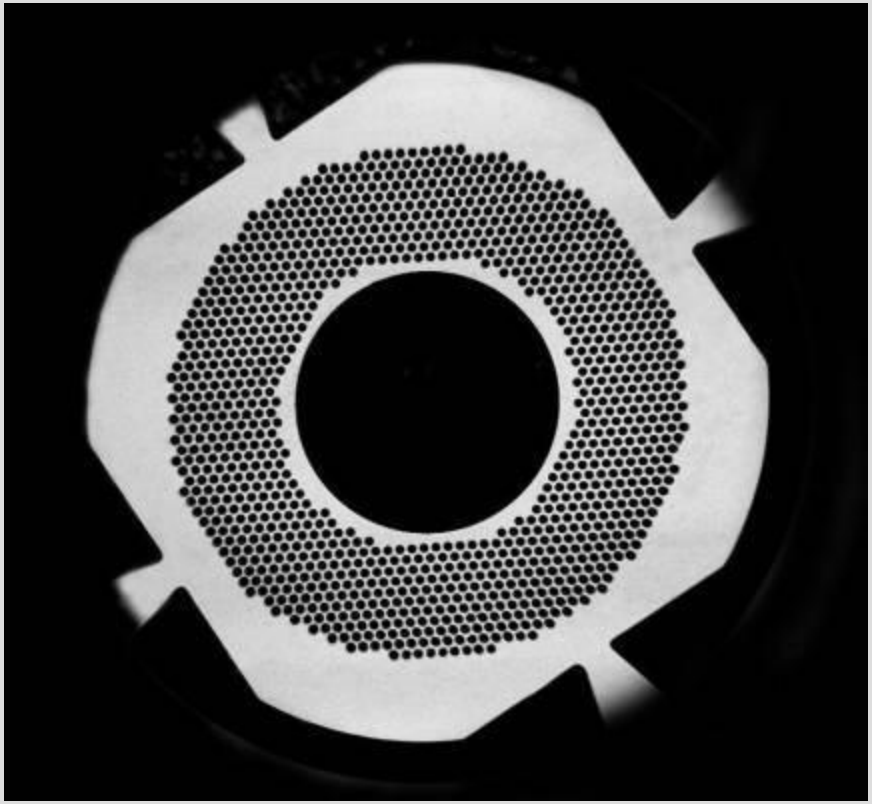
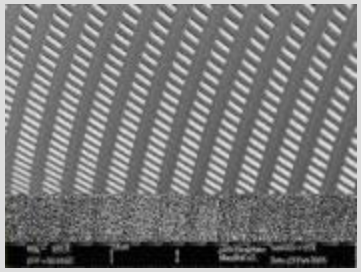
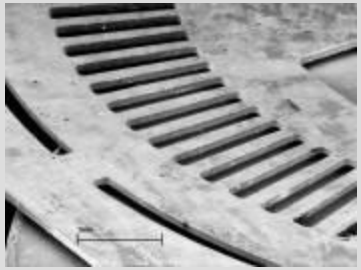
Products

- **Outlines**
- Structures / Topographies







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Products

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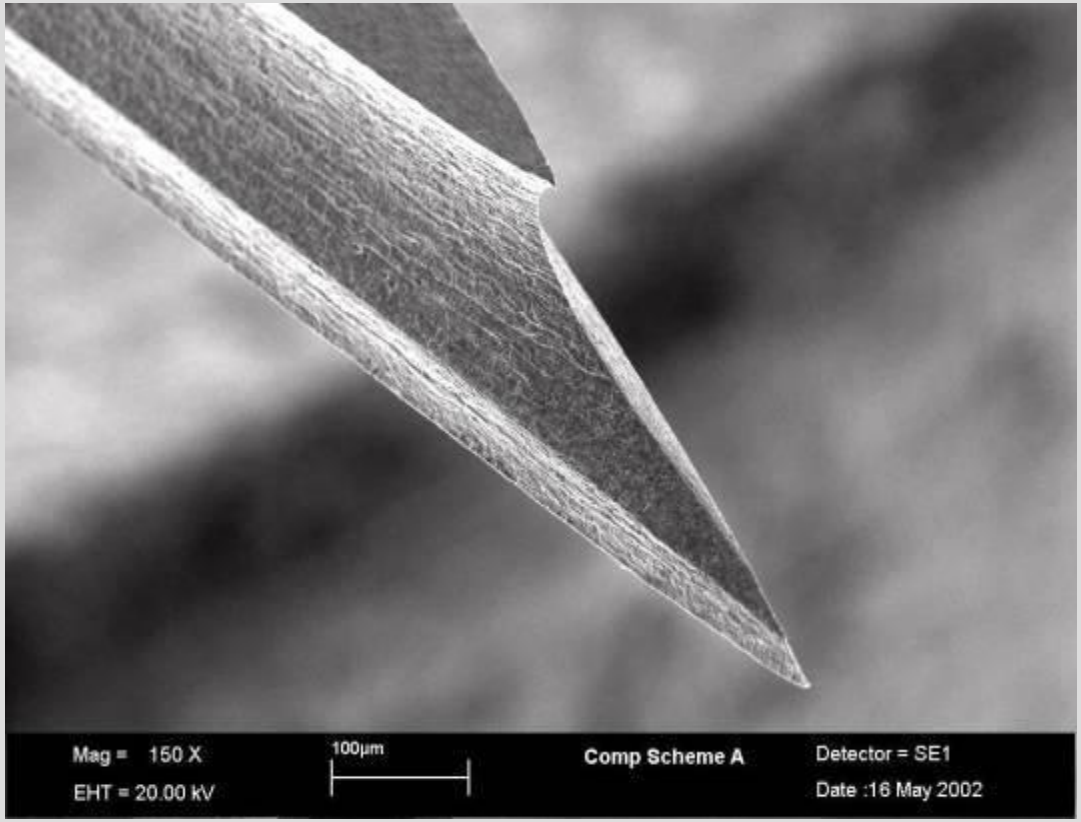

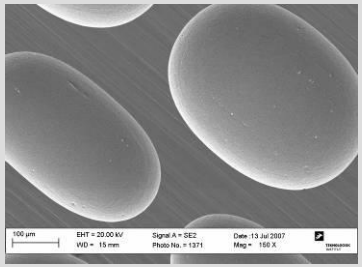

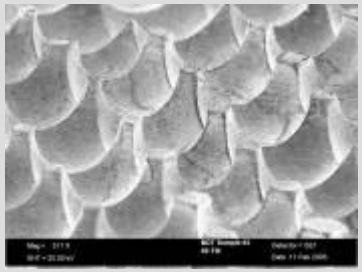

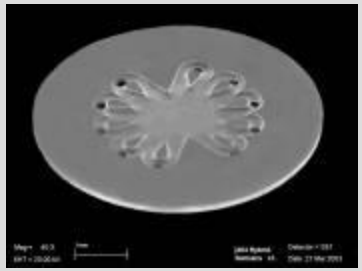

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MICROMETAL‘s target

We industrialize product ideas

We are open for ideas !

Customers


Continental

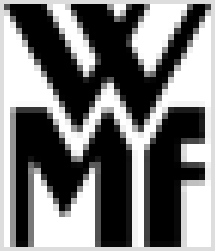

FLEXTRONICS


Heraeus


INVISTA
LYCRA


Prym


Roche

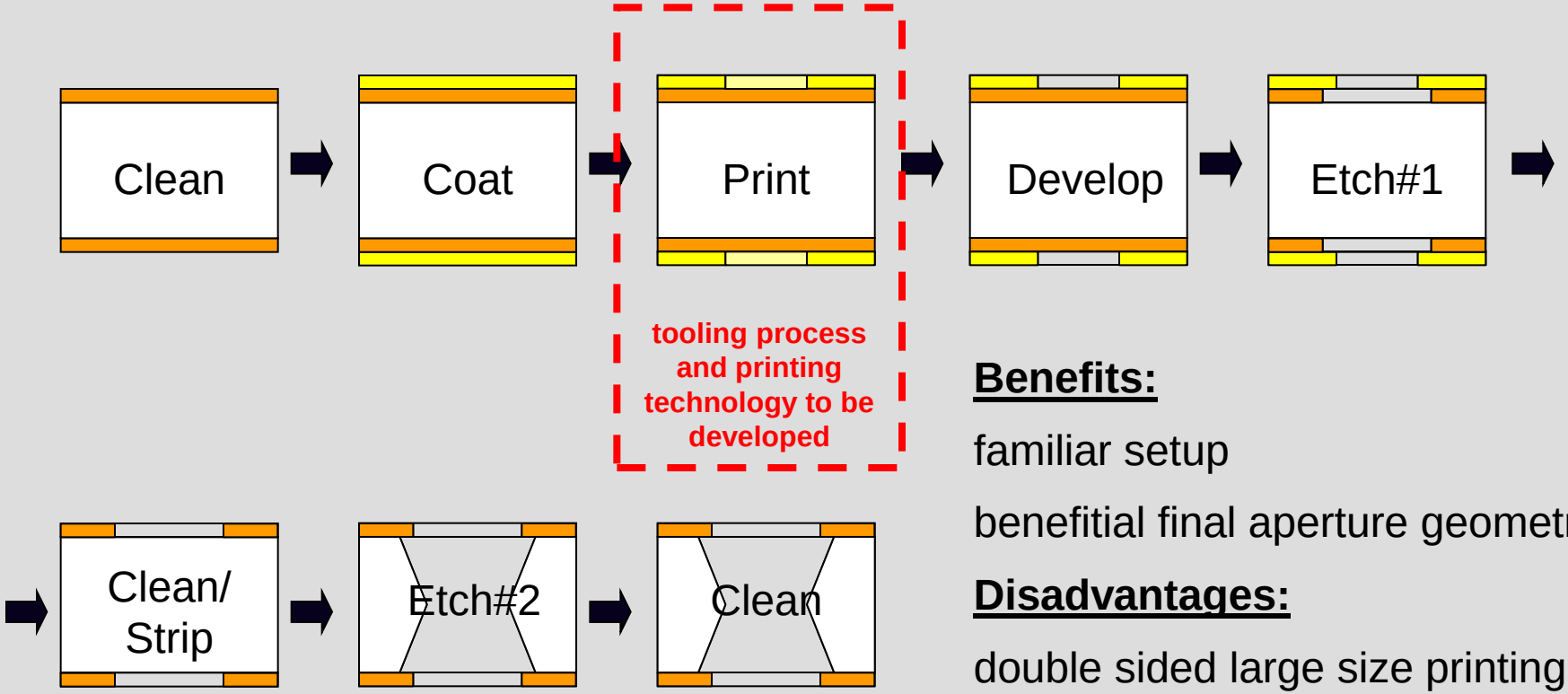

WMF


Ford


hp


HILITE
INTERNATIONAL

GEM process MICROMETAL



Benefits:

familiar setup

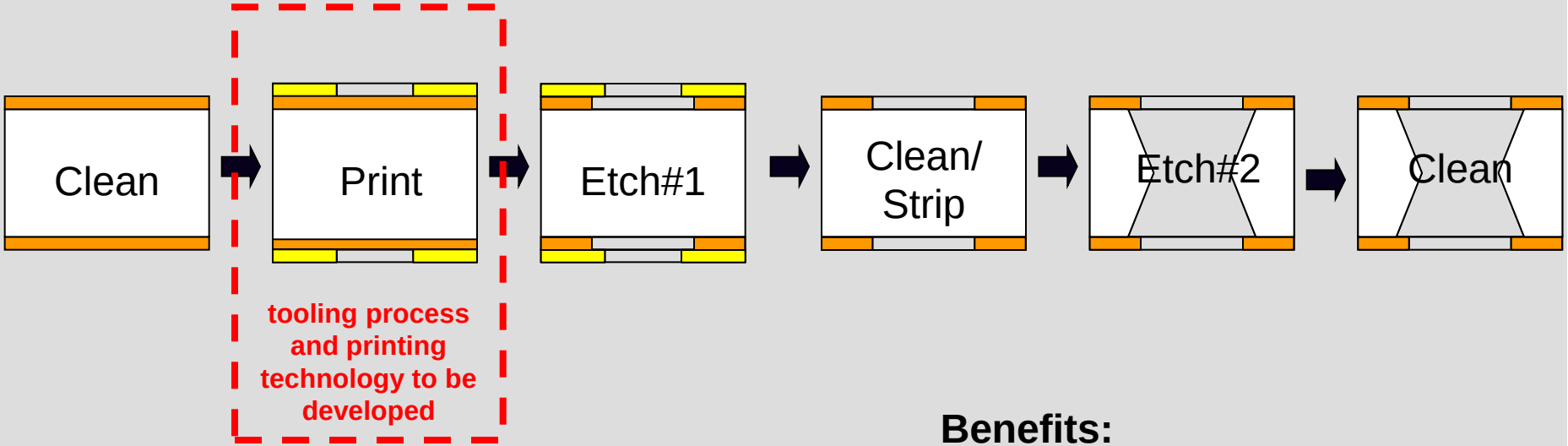
benefitial final aperture geometry

Disadvantages:

double sided large size printing

Process chain w/ many steps

Future potential GEM process



Benefits:

reduced # of steps

benefitial final aperture geometry

Development needed:

continuous printing process tbd

Thank you for your attention!

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