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Laser-Feinschneiden | Microwaterjet

Microprecision waterjet cutting / waterjet fine machining

Opportunities and potential of a new production process

as an example for punched plates, samples, prototypes, and small to medium runs

- **What is the difference between conventional waterjet cutting and our microprecision waterjet cutting process?**

	previous waterjets	Microprecision waterjet cutting
Applications	Large plates, almost any material	Small, delicate, and micro components, almost any material
Jet diameter	> 0.8mm	<= 0.3mm
Machine tolerance	> 0.02mm	0.002mm
Cutting tolerance	> 0.2mm	0.02mm **(repeatable precision)**
Cut surface	> Ra 5µm	to Ra 0.8µm (N6)
Machine design concept	Classical machine design	Fine precision mechanics / similar to wire EDM machines

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	Micro waterjet
Limits and disadvantages	• Imprecision increases for thicker parts • max. 15 mm thickness (depending on material) • Operating costs (abrasives, nozzles)
Advantages	• Almost any material (included coated materials) • Cold process, no heat effects, no change to microstructure or properties • No material stress • High quality cut surfaces • Almost no burring • Very narrow webs are possible • Very economical for thicknesses of 0.8 – 5 mm or different materials • No tooling costs, flexible

	Laser fine machining
Limits and disadvantages	• Material: must not be sensitive to heat or reflective • Max. thickness approx. 2 mm • Hot process • Cut surface: Microstructure changes, stresses • Cut surface: Changes to mechanical properties (=> effects on component and tool design) • Cut surface: spatter, “canyon” structure, burring, color change • Toxic fumes
Advantages	• Fast (depending on material and thickness) • Flexible

	Wire EDM
Limits and disadvantages	• Starting holes • are slow • Material: must be electrically conductive
Advantages	• Very precise, even for large

	Punching
Limits and disadvantages	• Tooling costs & time for building tools • Expensive for small and medium runs • Material must be compatible with punching • Limits on web widths • Limits on material thickness
Advantages	• Very efficient for large runs

Other: Micromachining (tooling costs, slow), etching (only a few thin materials and large runs)

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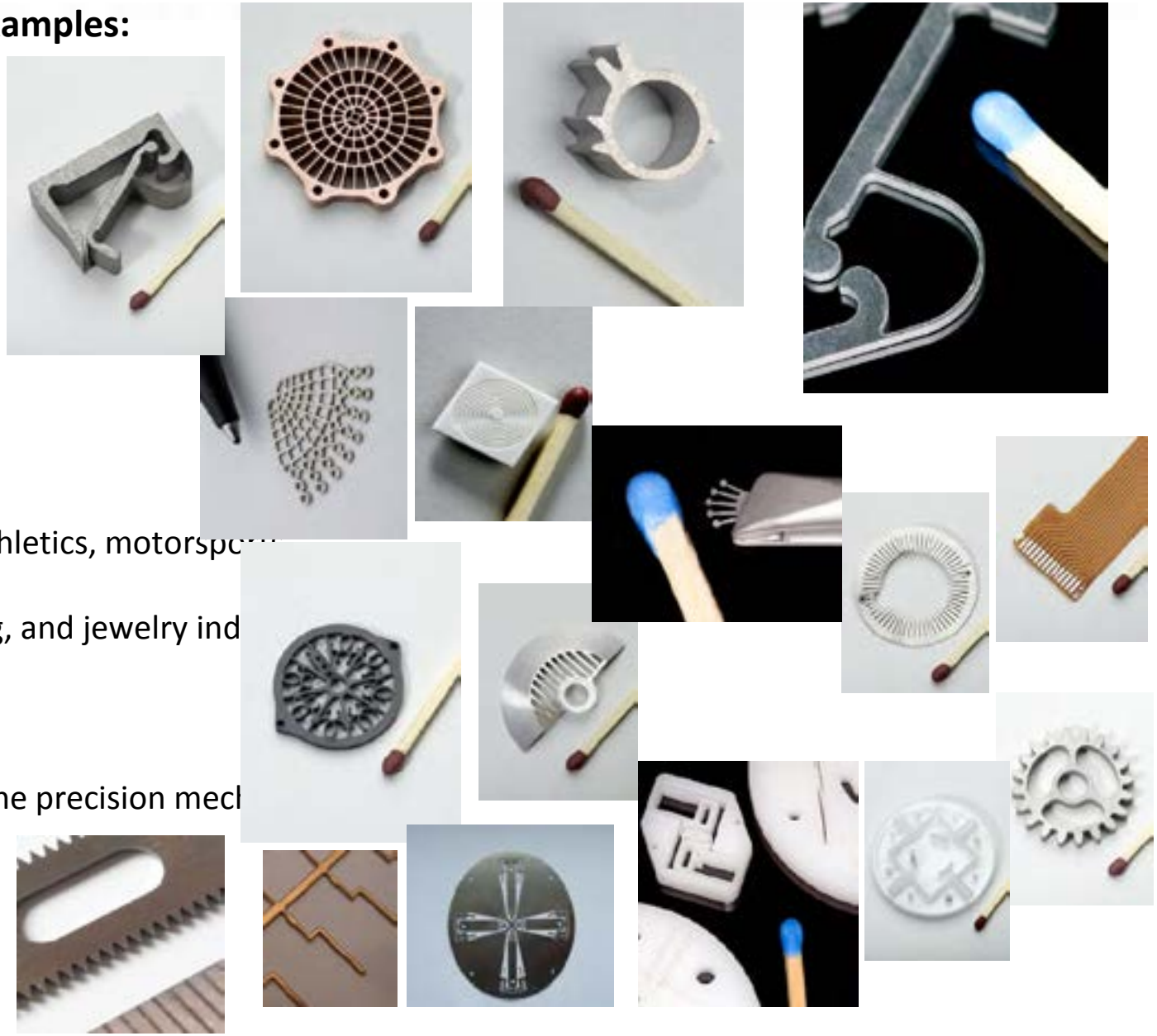
Applications and examples:

- Electrical industry
- Automotive industry
- Medical technology
- Machine building
- Optical industry
- High performance athletics, motorsp
- Design, watchmaking, and jewelry ind
- Aerospace industry
- General micro and fine precision mecl



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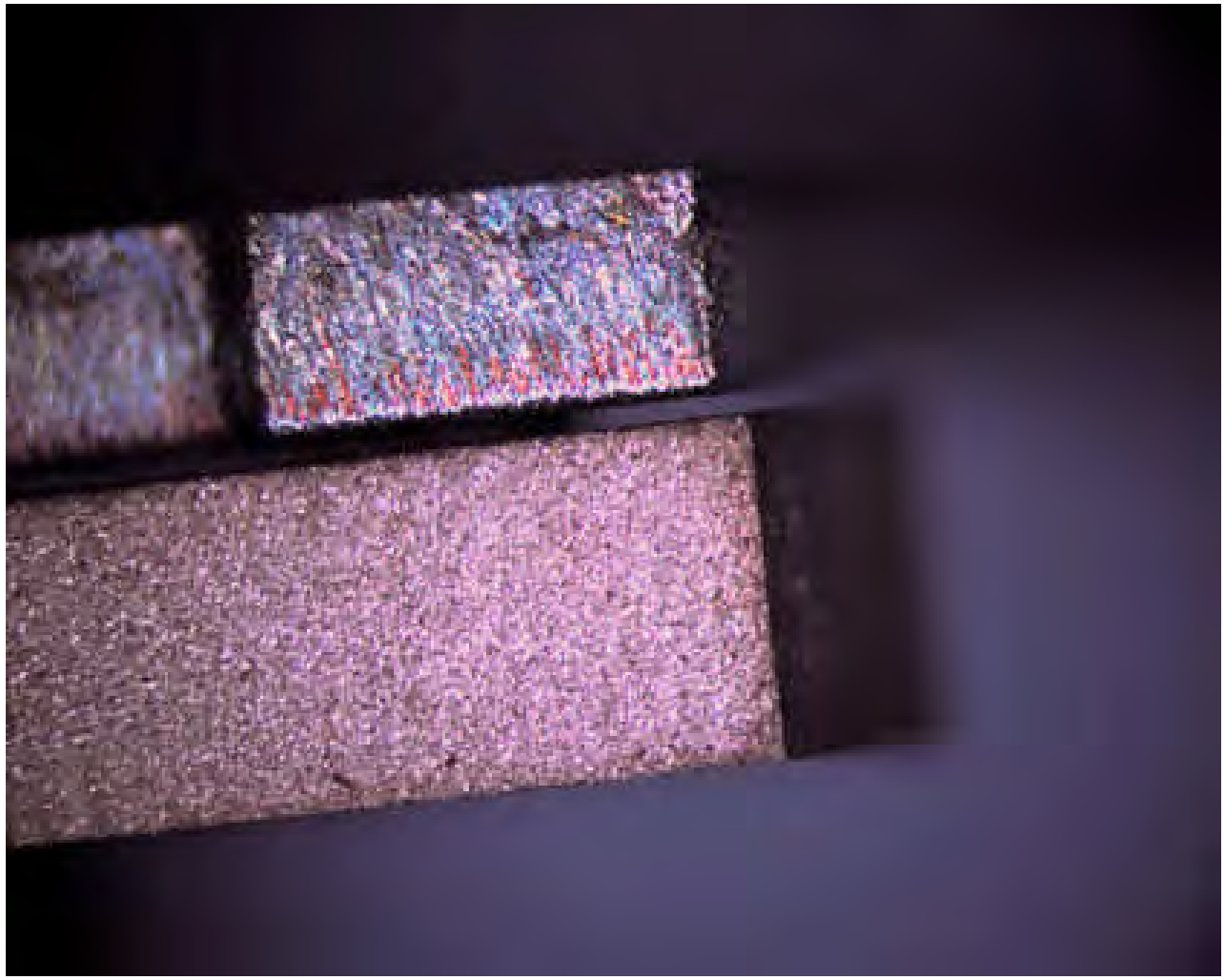
Shop report 1: Bus bar: Copper, 3 mm thick Tolerance: +/-0.03 mm (reliable process / repeatable precision)

Shop report 2: Laser fine machining edge for 2 mm thick copper versus micro precision cut edge for 3 mm thick copper



Shop report 3: Copper punched plates: Pilot runs.

Comparison of fine laser cutting + tin plating + bending, <u>versus</u> microprecision waterjet cutting + tin plating + bending

Laser: Swarf/tinsel that can be chipped of and expose the copper

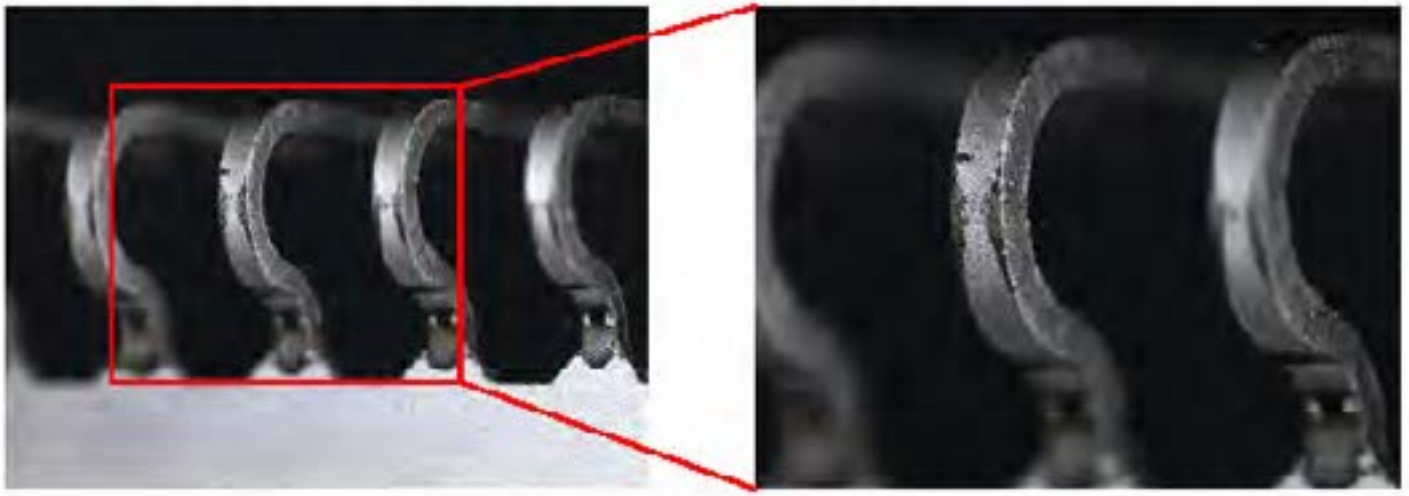
Waterjet: No swarf/tinsel

Shop report 3: Copper punched plates: Pilot runs.

Comparison of fine laser cutting + tin plating + bending, versus microprecision waterjet cutting + tin plating + bending

Biegen wasserstrahlgeschnittener Muster

Micro precision waterjet cut pattern after tin plating and bending



- Keine Flitter
- Keine Abplatzer
- Kein freiliegendes Kupfer

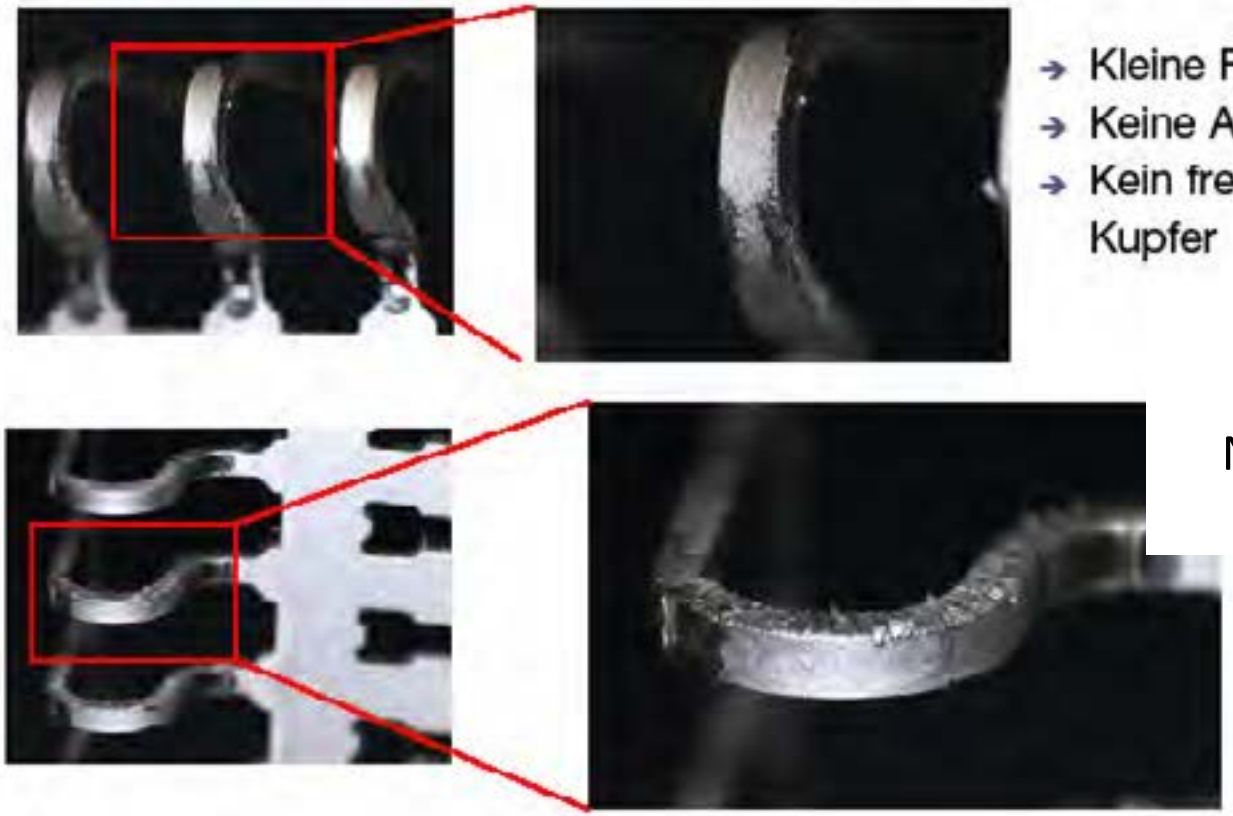
No swarf/tinsel, no chipping of, no visible copper

Shop report 3: Copper punched plates: Pilot runs.

Comparison of fine laser cutting + tin plating + bending, versus microprecision waterjet cutting + tin plating + bending

Biegen wasserstrahlgeschnittener Muster

Laser cut parts after tin plating and bending



- Kleine Flitter
- Keine Abplatzer
- Kein freiliegendes Kupfer

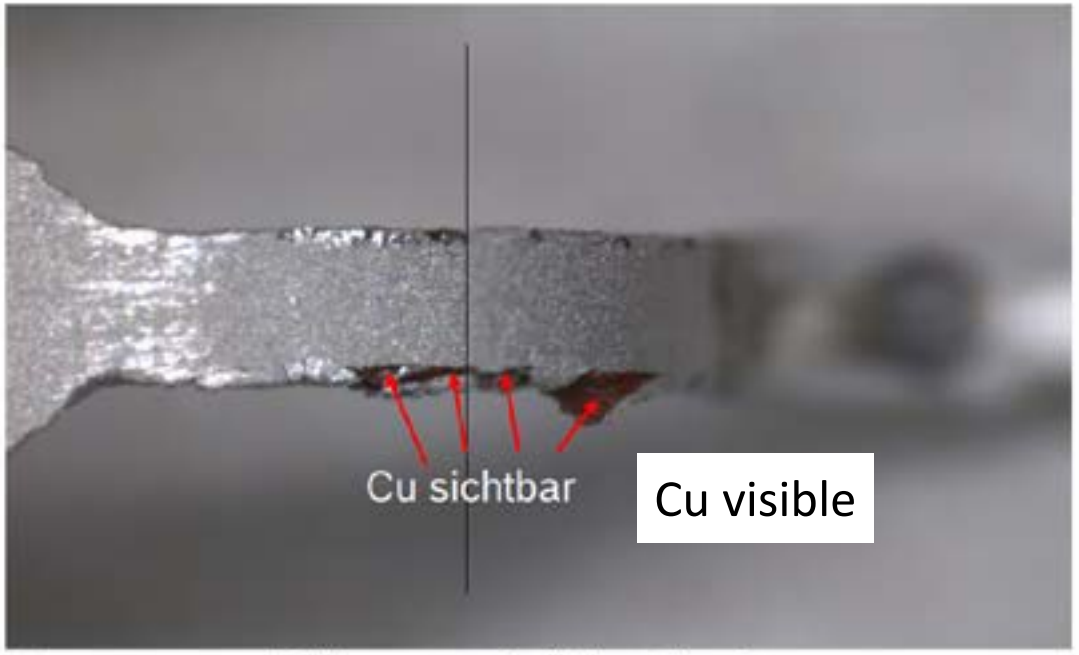
Swarf / Tinsel
No chipping of
No visible copper

Shop report 3: Copper punched plates: Pilot runs.

Comparison of fine laser cutting + tin plating + bending, <u>versus</u> microprecision waterjet cutting + tin plating + bending

Swarf / tinsel + exposed copper after laser fine cutting, tin plating and bending

<u>Other</u> laser cut parts from competitors for comparison



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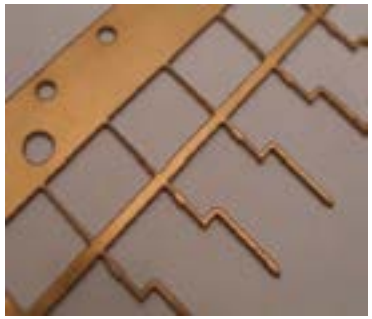
Technical parameters for DeSta:

- Almost any material, up to approx. 15 mm thick (depending on process, tolerance, and material)
- Positioning precision 0.002 mm
- Cutting precision up to ± 0.01 mm (depending on material and thickness), reliable process / repeatable precision
- Surface quality up to N6! (Ra 0.8)
- Max. workpiece size 1000 x 600 mm
- Web widths to 0.2 mm
- Jet / beam diameter: 0.3 mm (waterjet cutting) / 0.05 mm (laser fine machining)

Materials:

Copper and copper alloys, aluminum, other non-ferrous metals, coated materials / surface treated materials, bimetals, plastics and composites, high performance ceramics, carbon, steel and chrome alloys, titanium, tungsten, tantalum, silicon, rubber, silicone, rare earths, noble metals, new materials, and thus nearly any material.





SUMMARY:

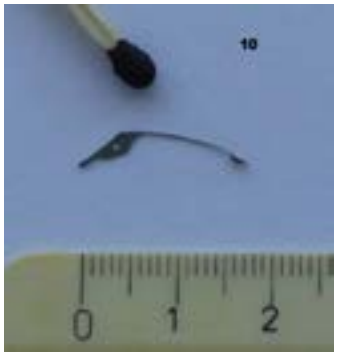
⇒ **Microprecision waterjet cutting is an ADDITION to established cutting technologies**

⇒ **for applications where established cutting technologies have reached their limits, or have technical, qualitative, or economic problems, micro precision waterjet cutting can provide a solution**

CONCLUSION:

⇒ **For every component, it is worth investigating whether micro precision waterjet cutting is the most economical and qualitatively best cutting process**



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- **How can you access this new technology?**

⇒ **Commission work, sample parts, process development, technology center, technology development in cooperation with machine builders, consulting, pioneer, and leading experts:**

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- **What can DeSta microcut do?**

⇒ Microprecision waterjet cutting
⇒ Laser fine machining and laser drilling
⇒ Milling and drilling, threads, reaming
⇒ Vibratory grinding
⇒ Bending
⇒ Riveting, brazing, shrinking, polishing,…
⇒ Surface treatments, such as tin plating…
⇒ **FINISHED COMPONENTS**