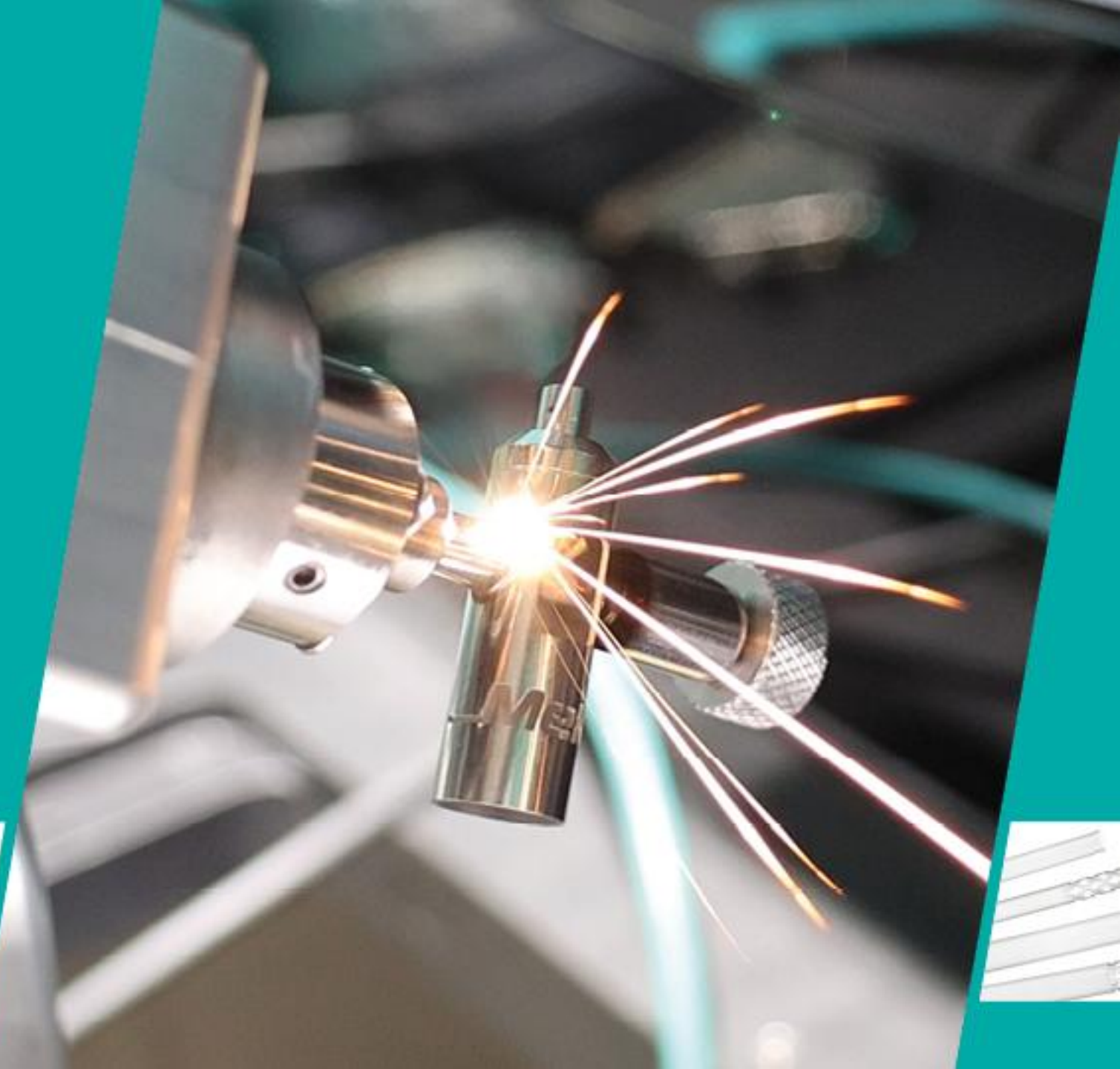
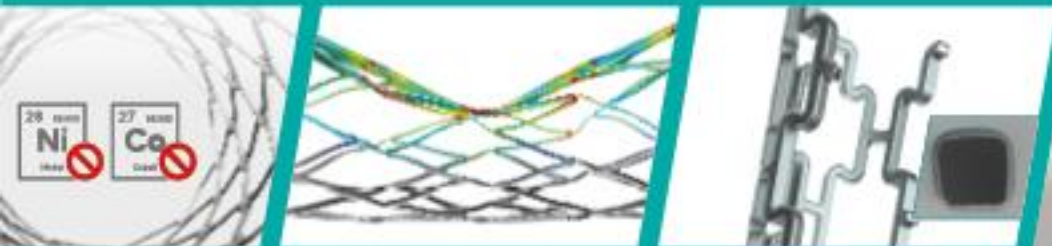


PRECISION IS OUR PROFESSION

MeKo.de

Laser Welding for Microassembly



Agenda

MeKo MedTech

Laser Welding for Microassembly

Questions & Answers



Our Mission

We partner with our customers to enable the development of **safe, innovative, and affordable** medical devices to improve healthcare globally.

Who **we** are

ISO 13485
ISO 9001

FDA
registered

160,000
sq. ft.



Working for the Future

Our dedicated team is constantly innovating and elevating standards.

Materials

- Resoloy®
- PolyMediX®
- Vasculoy®

Inspection & Analysis

- MedLab

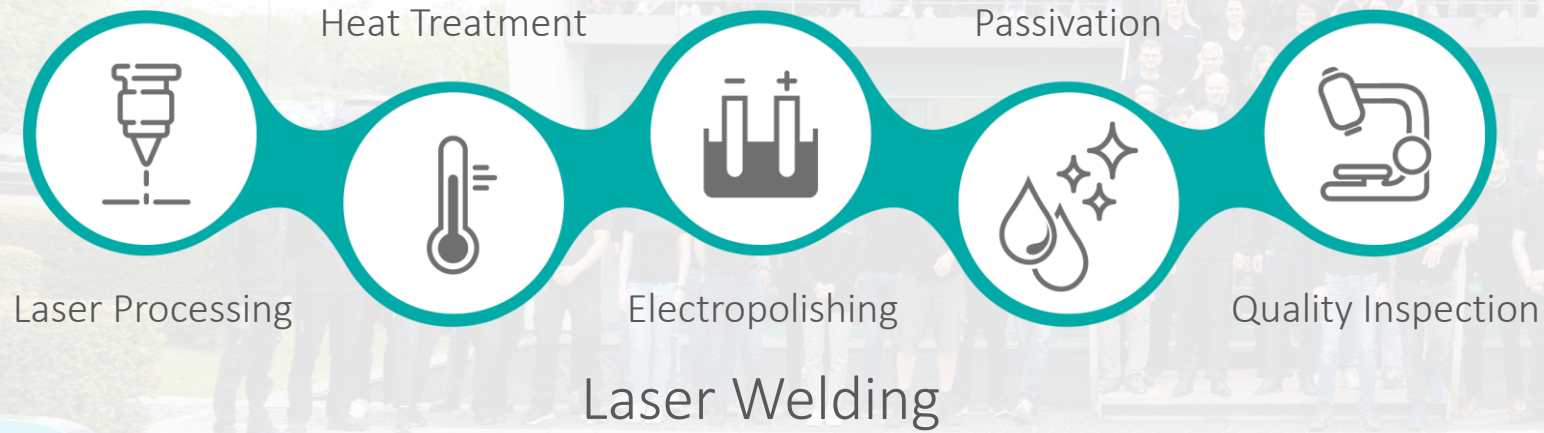
Automation

Manufacturing Processes

Working for the Future

Our dedicated team is constantly innovating and elevating standards.

Manufacturing Processes



Working for the Future

Our dedicated team is constantly innovating and elevating standards.

Manufacturing Processes



Laser Welding

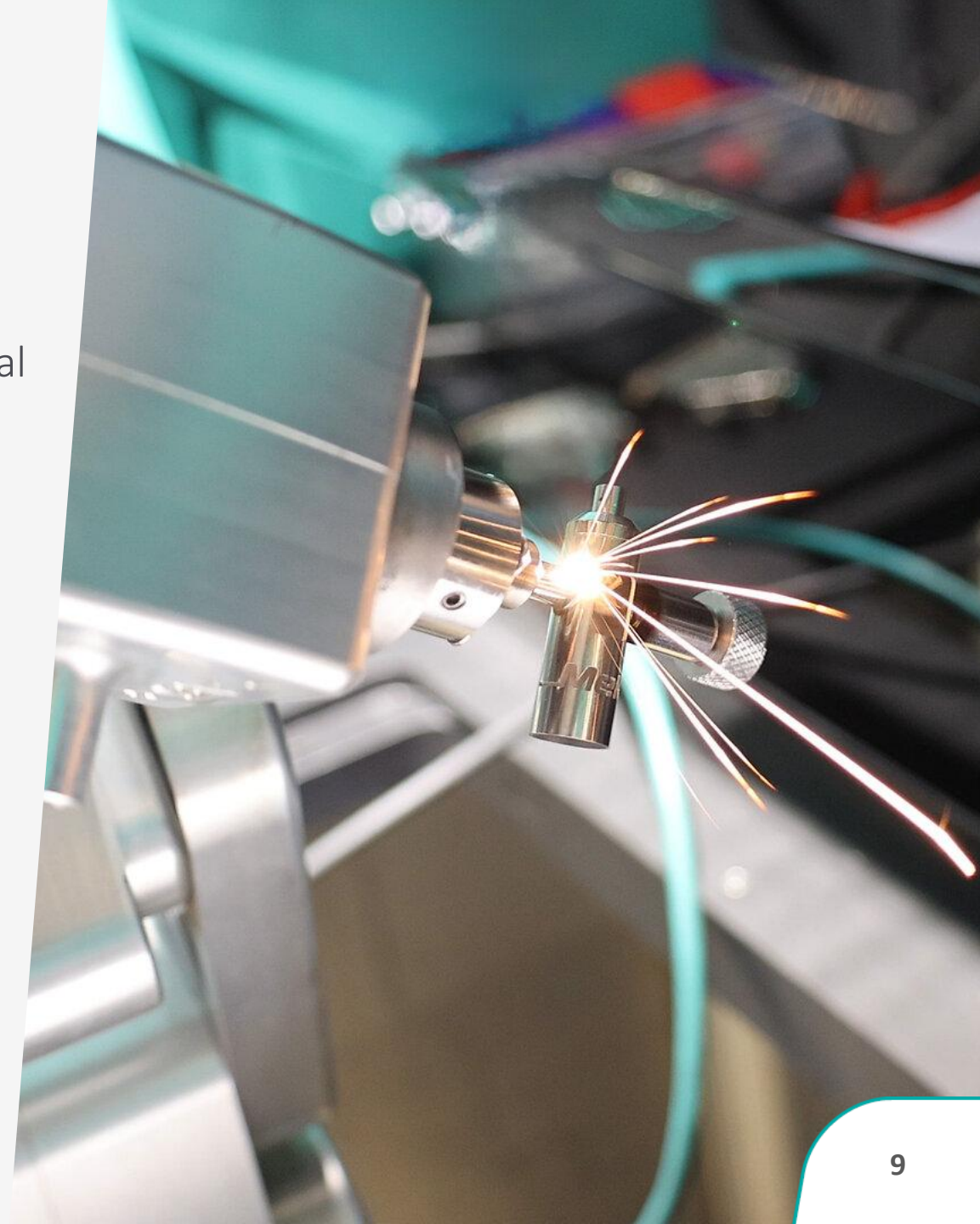
Laser Welding for Microassembly

- Joining of micro-scale components (μm –mm range)
 - Delicate structures
 - High precision
 - Low heat input
 - Strong, reliable, repeatable & clean joints
- Laser welding highly suitable for joining of microassemblies



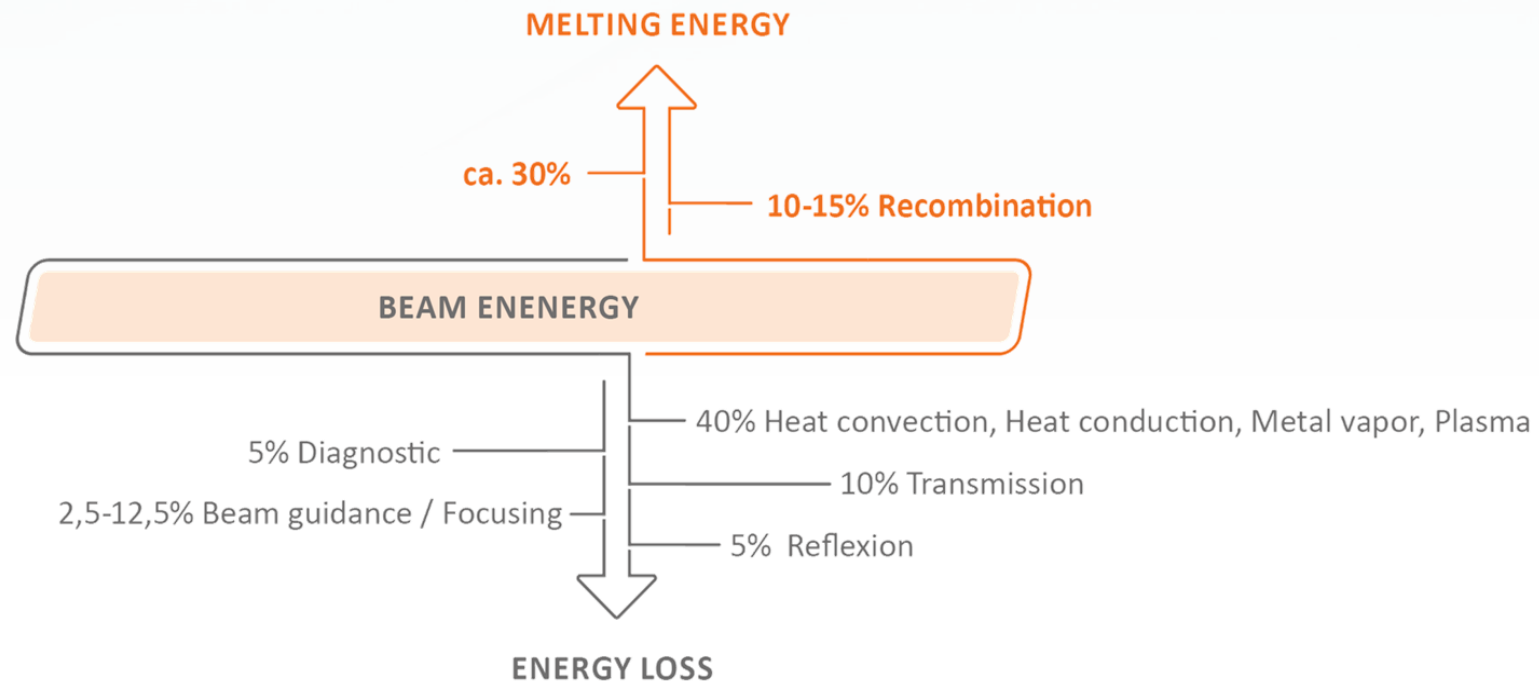
Basic Concept

- Welding: Joining of materials (metal/non-metal) by local melting
 - > Common weld which contains material of both joining partners
 - > Permanent, cohesive bond
- Filler material optional
- Minimum required laser power density for welding:
 $\approx 1 \cdot 10^5 \text{ W/cm}^2$ [1] ($\approx 6,5 \cdot 10^5 \text{ W/in}^2$)



Mechanisms for Coupling Energy

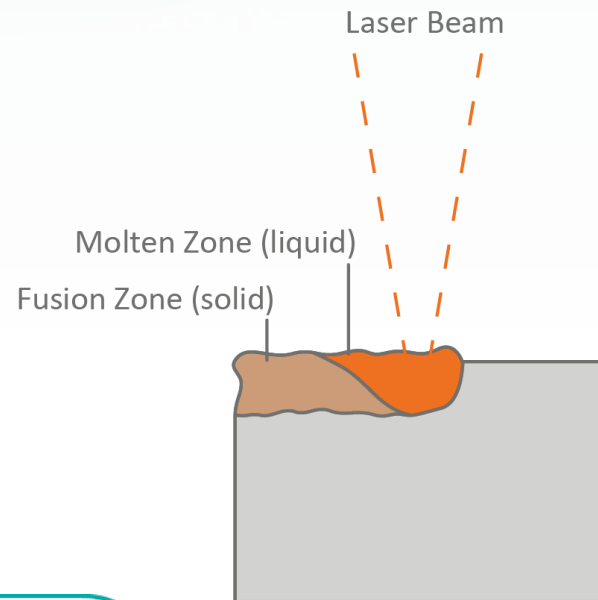
- Laser welding: melting by absorption of laser energy (Process 52 according to ISO 4063)
- Max. 45% laser energy absorption by the material for melting



Welding Methods

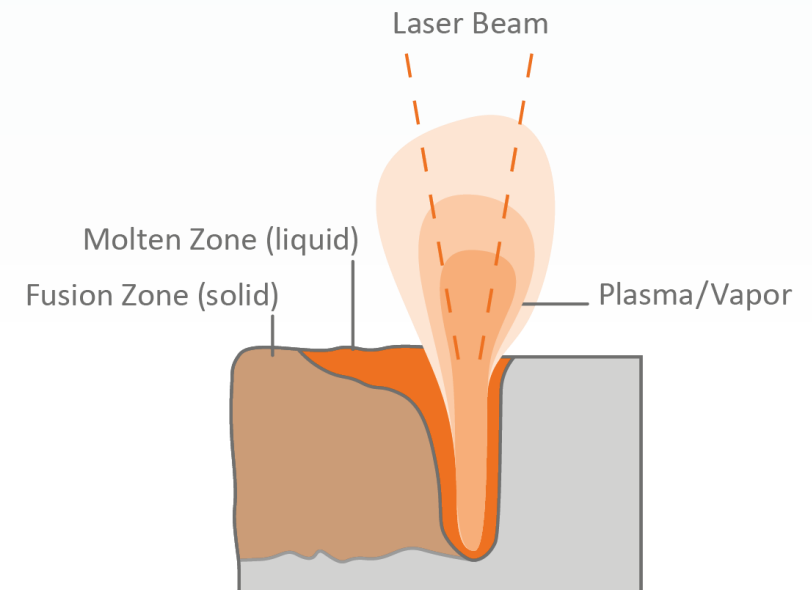
Heat conduction welding:

- Low penetration depth
- Smooth/smoothened surface



Deep welding:

- Ratio between depth and width 1:1 to 15:1



→
Welding Direction

Welding Types



Laser spot welding:

- Single pulse
 - > Single weld spot



Laser stitch welding:

- Sequence of overlapping weld spots (discontinuous seam)
 - > Combination of strength & minimal heat input



Laser seam welding:

- Continuous laser movement along joint
 - > Full seam

Laser Welding - Pros

- Wide range of materials
- Very small to big parts
- High power density
- Small beam diameter
- Small heat-affected zone
- Low thermal stress on joining partners
- Low distortion due to heat



Filtration



Pharma



Mechanical
Engineering



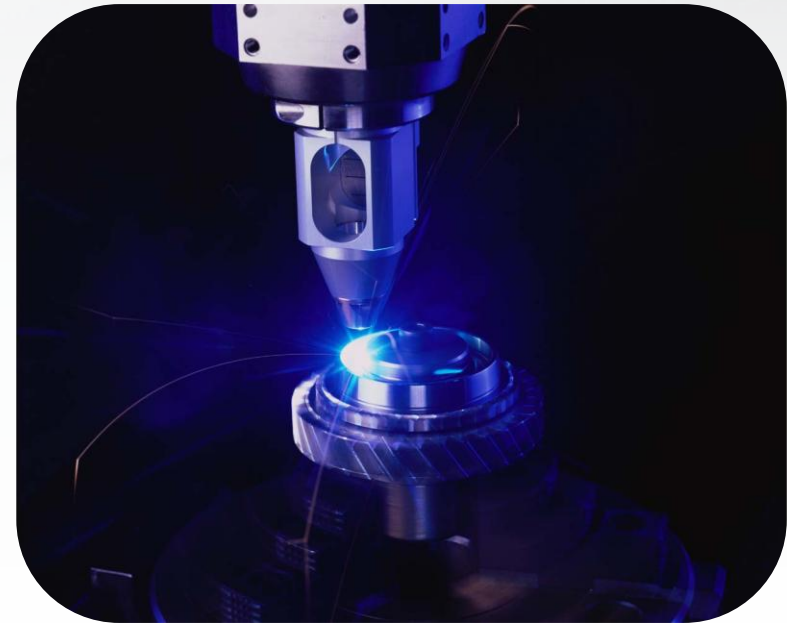
Automotive



Aerospace

Laser **Welding** - Pros

- Contact and wear-free tools
- Process is well adjustable and highly repeatable
- High feed rates
- Very good seam surface and seam properties



[2] TRUMPF GmbH + Co. KG

Manufacturing Requirements

- Zero gap between welding partners
- Reliable positioning & well-planned welding sequence
- Consistent laser source
- Protection against laser radiation



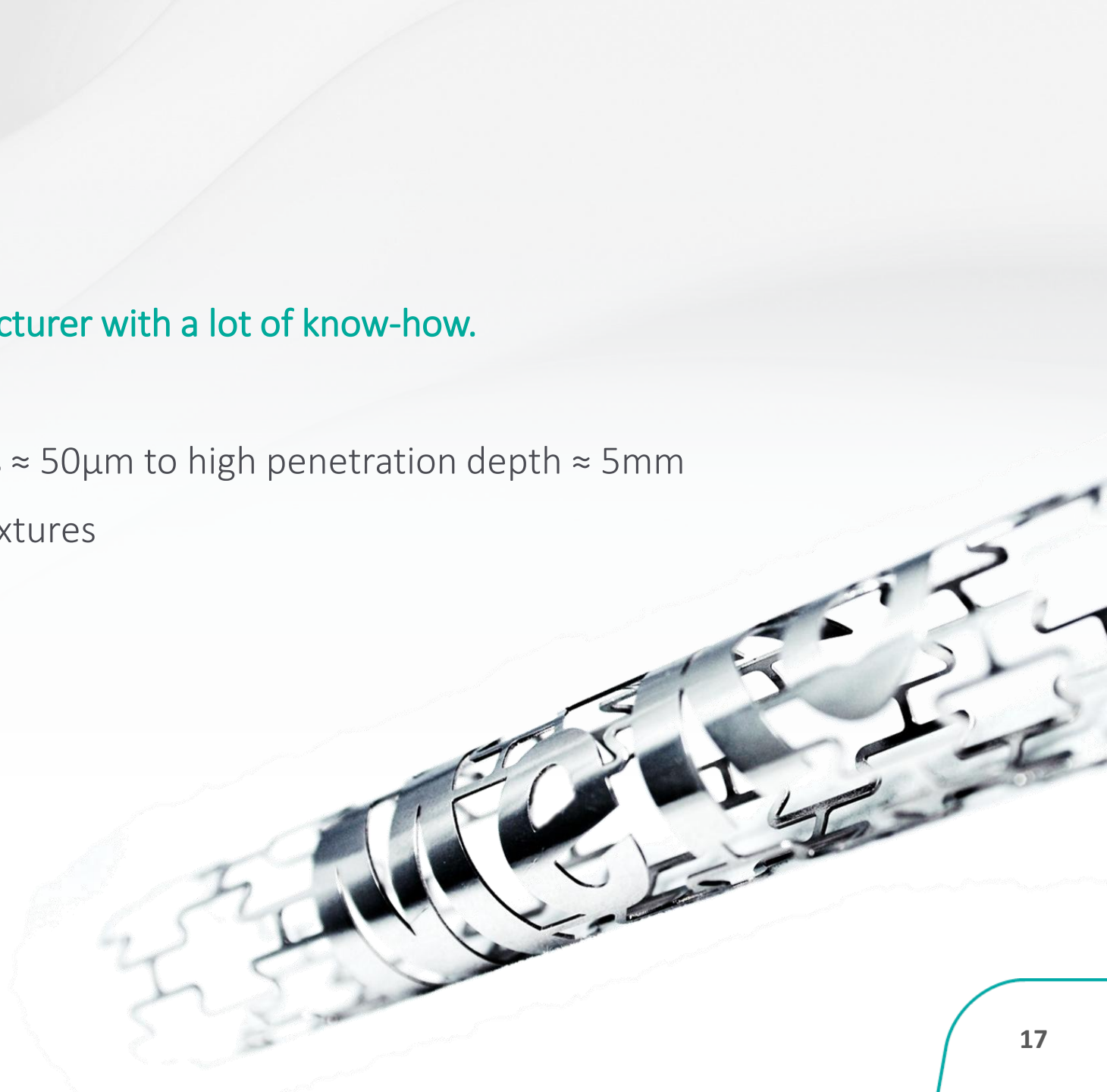
Manufacturing of Medical Devices



What we offer

We provide solutions – as contract manufacturer with a lot of know-how.

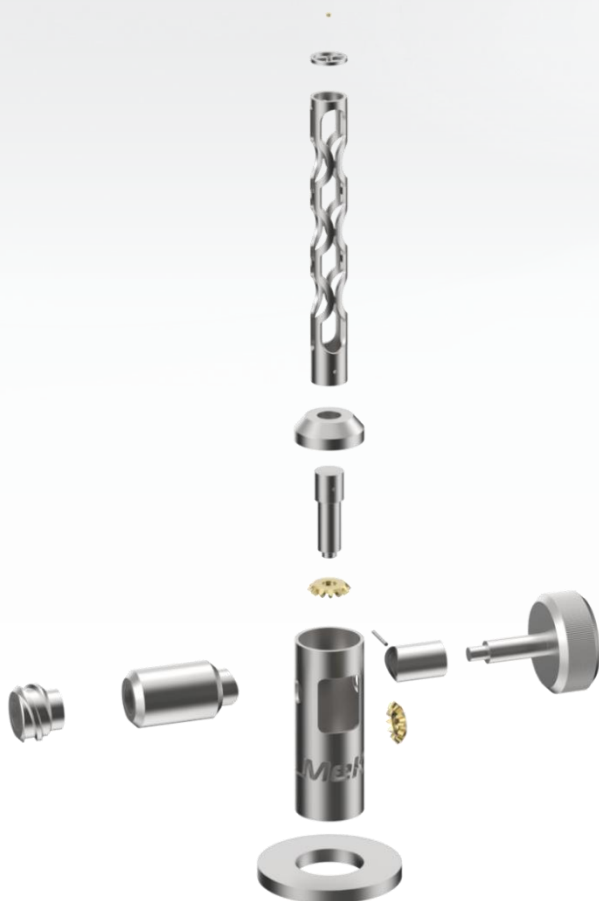
- From Prototype to Series production
- From very small welding seams for parts $\approx 50\mu\text{m}$ to high penetration depth $\approx 5\text{mm}$
- In-house design and manufacturing of fixtures
- Post Processing & additional services
- Support e.g. during development



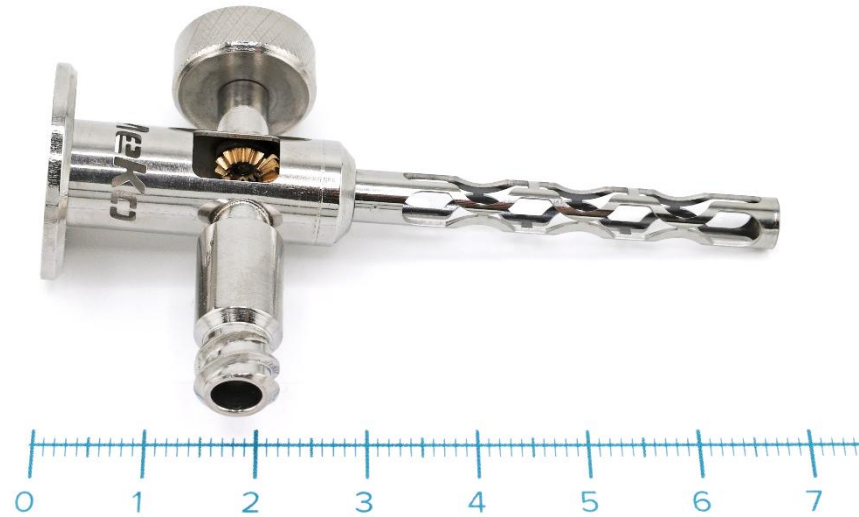
Welding Examples



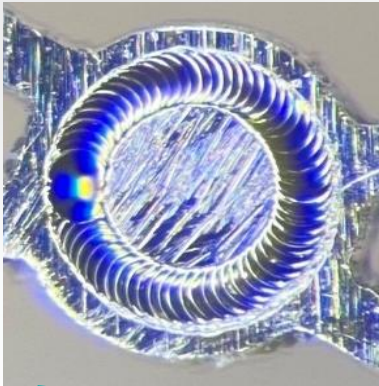
MeKo Events



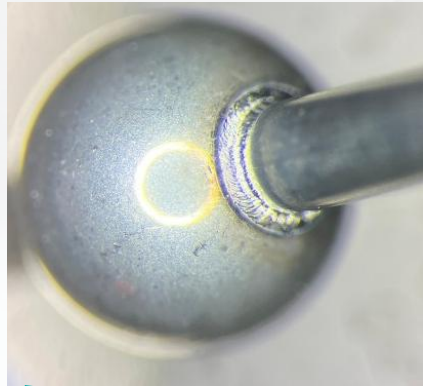
Welding Examples



What is possible?



Ø 70µm Tantalum marker welded to stent



Ø 2mm Sphere welded to a wire



Cap welded to a tube Ø <1mm



Two sheets of 1mm

Manufacturing Processes - Example



Incoming inspection of parts

CAD/CAM

- Creating code to operate our welding laser machines

Preparation and set up

- Design of fixtures (if needed)

Cleaning of parts prior to welding

Welding of parts

- In-Process-Control

Final cleaning

- Cleaning & Passivation

Quality Inspection

- Visual and automatic microscopes

Shipping

IPC & Post Inspection Options

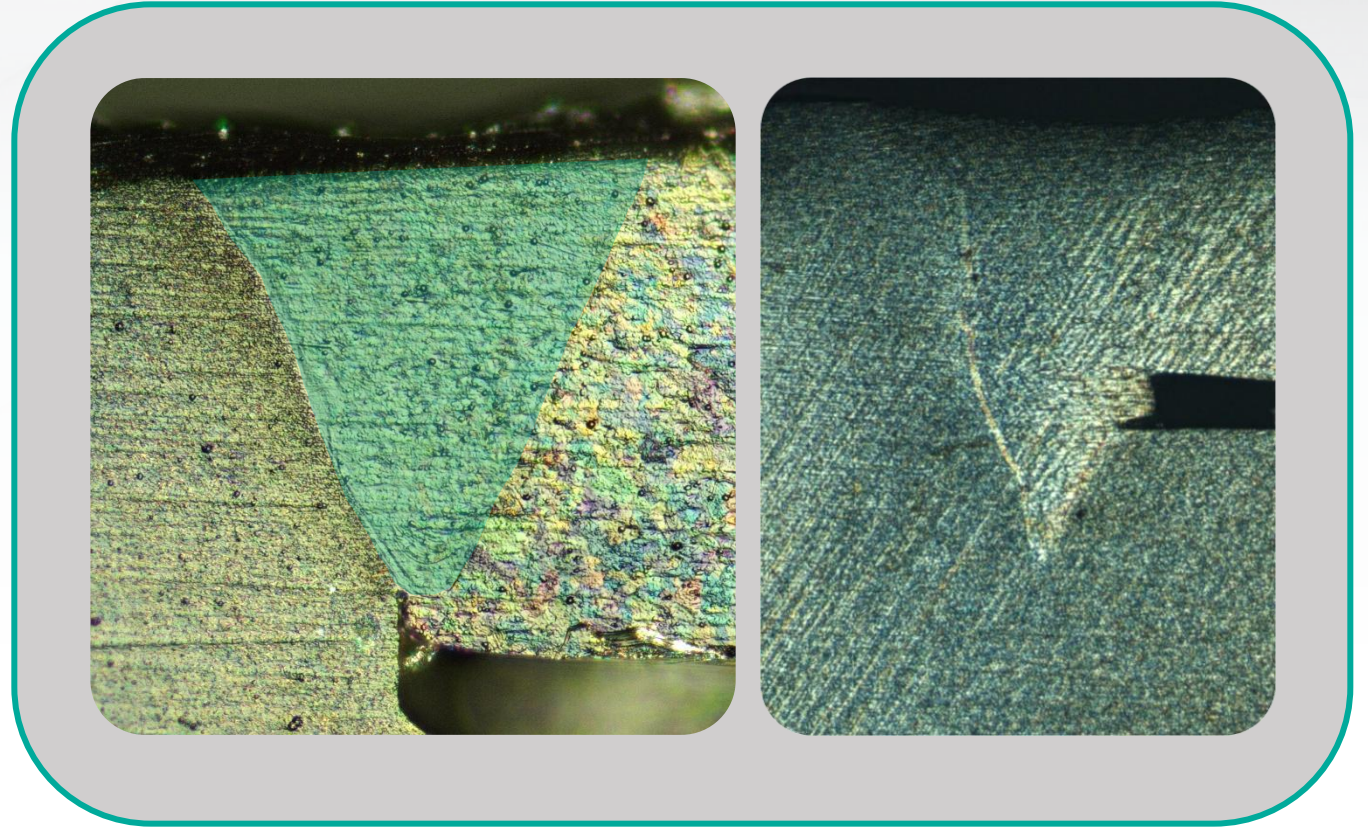
- Optical and geometrical inspection
- Pressure test
- Measurement of extraction forces
- Tensile strength evaluation
- Bending test
- Cross section of seam
- Grain size measurement
- ...



Post Processing Example - Cross section

(destructive method)

- Penetration depth
- Changes in grain structure
- Composition of the seam via EDX
- Heat affected zone
- Quality of the seam



What we need from You

- ✓ Accessibility
- ✓ Drawing
- ✓ Specifications:
 - > Dimensions
 - > Surface
 - > Material
 - > Mechanical properties
 - > ...
- ✓ Material ordering (optional)
- ✓ Are there any other requirements?



Why Laser Welding? Why MeKo?

Laser welding is:

- ideal for micro-scale joining applications,
- clean, accurate and consistent,
- proven for high-quality, repeatable results.

MeKo is:

- a reliable partner with deep laser welding expertise,
- driven by innovation and precision – for over 30 years,
- ready to support your microassembly challenge.



PRECISION IS OUR PROFESSION



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