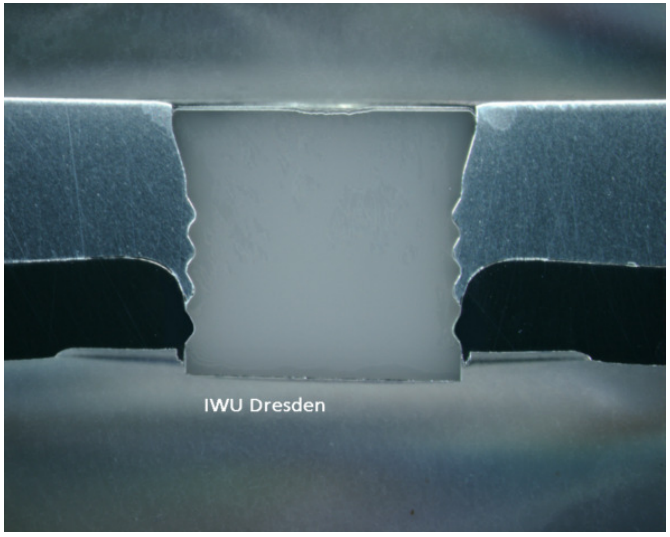
Solid riveting with ceramic elements

Fraunhofer Institute for Machine Tools and Forming Technology



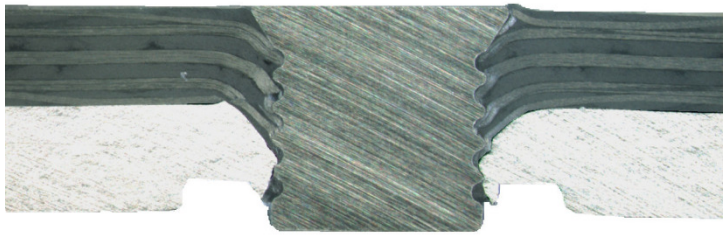


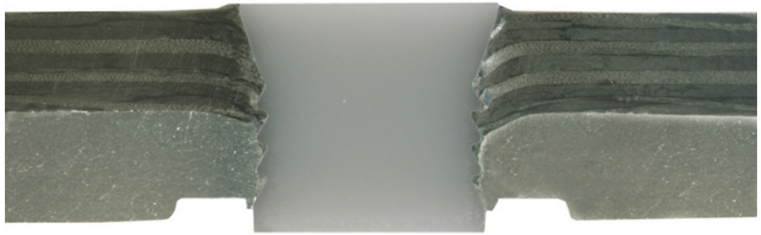
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1. Motivation

- Joining connections with magnesium, CFRP, Al-alloys with metallic connectors includes a risk of galvanic corrosion
- Axial preload after setting the rivet leads to tensile stresses in the head area
- Below a steel and a ceramic rivet



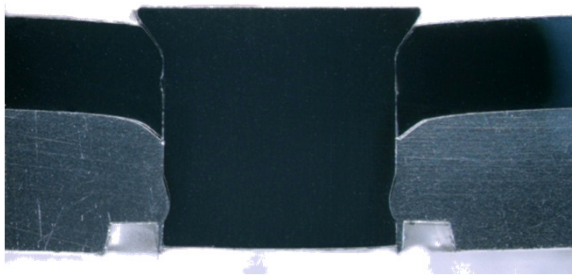


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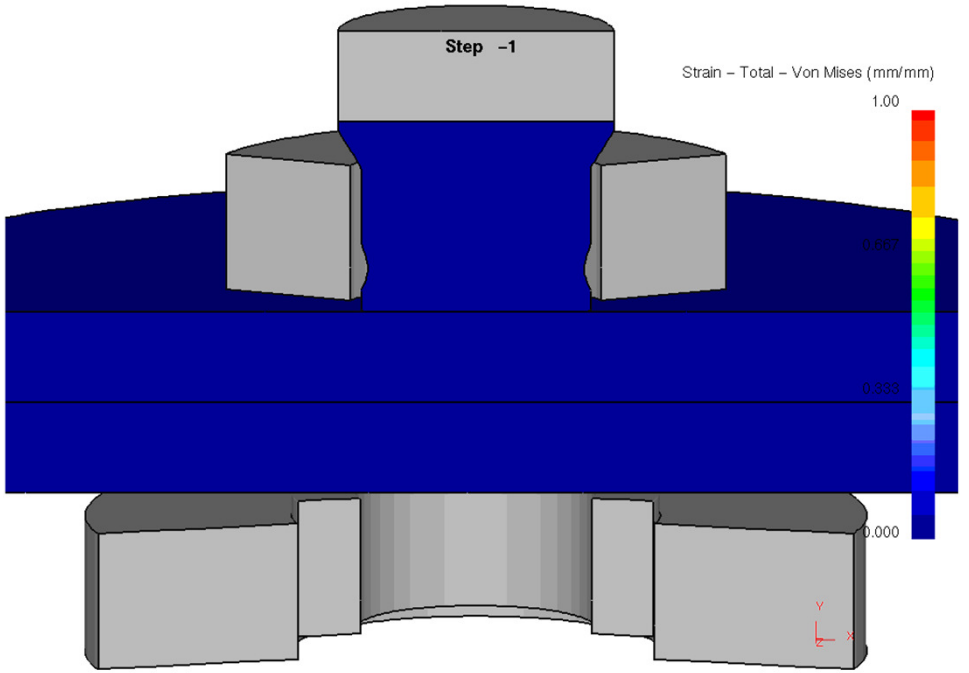
2. Process

Objective:

- Avoidance of corrosion in joining systems
- Avoidance failure of the ceramic rivet



standard steel rivet

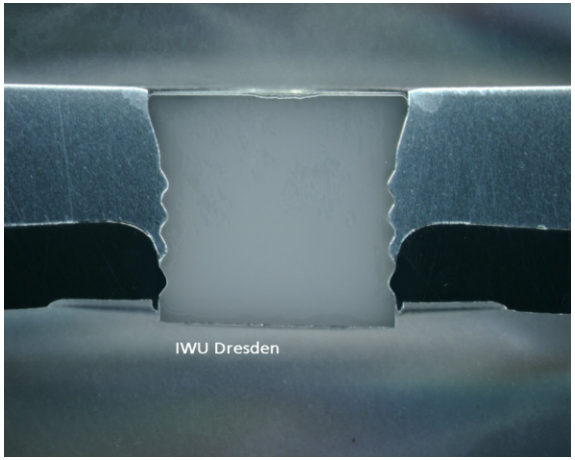


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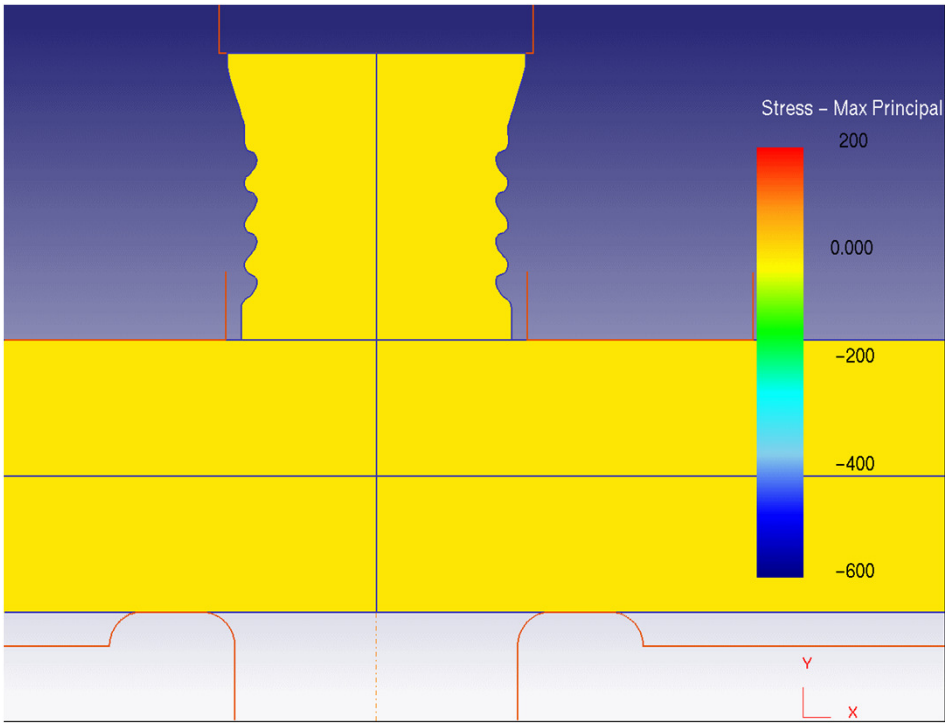
2. Process

Objective:

- Avoidance of corrosion in joining systems
- Avoidance failure of the ceramic rivet



ceramic rivet



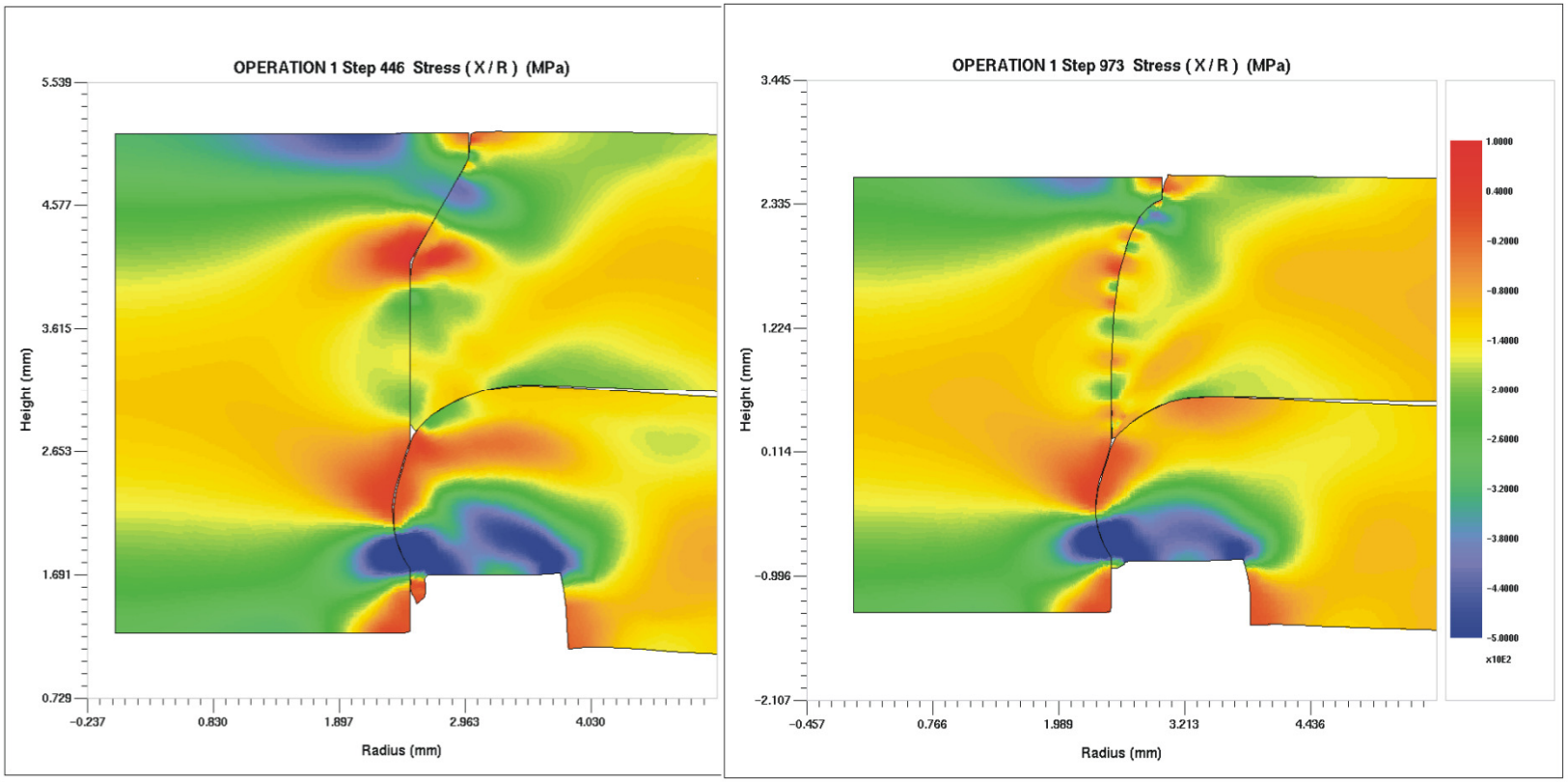
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2. Process

normal rivet

optimized rivet



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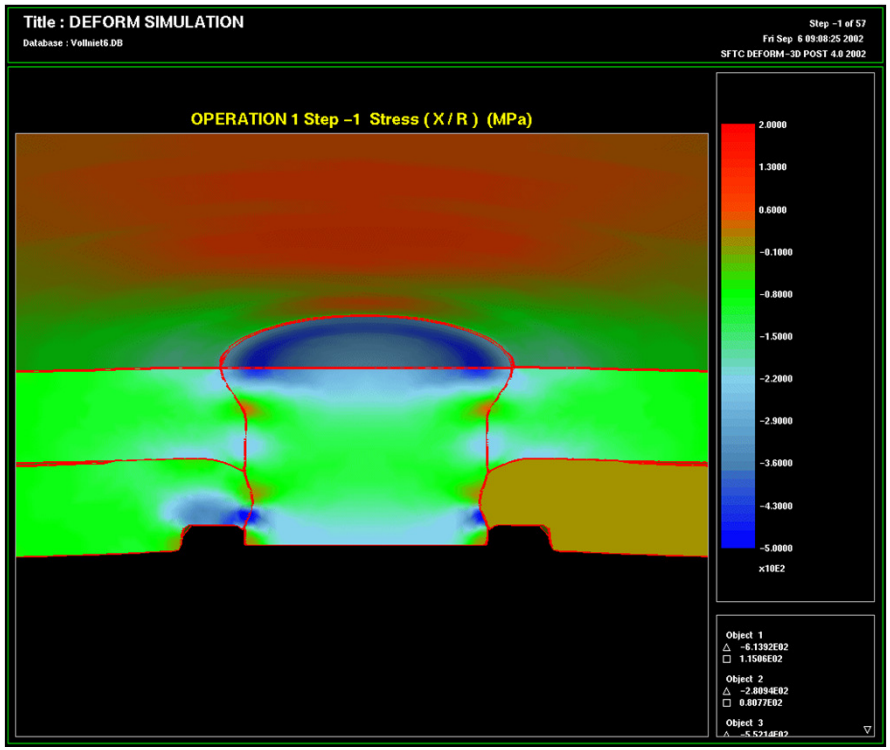
2. Process

Advantages of the process:

- Solution to corrosion problems

Limitations:

- Cost
- Numerical forecast
- Strength limits

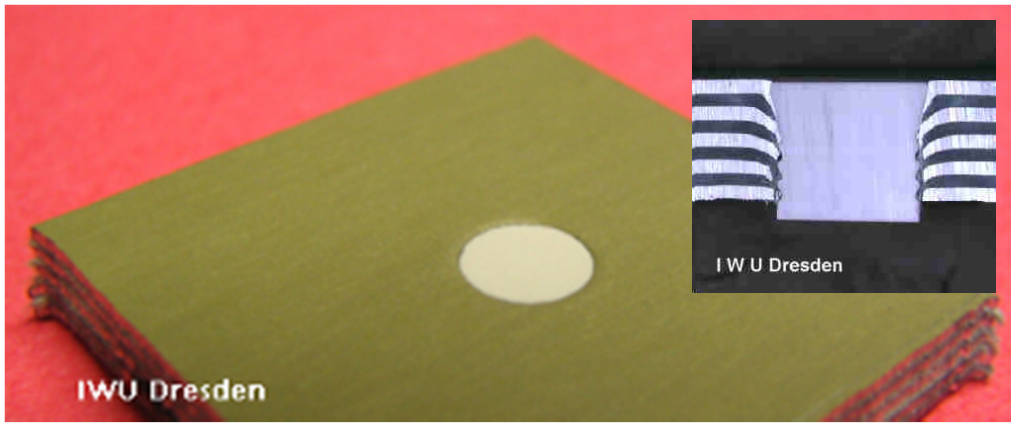


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3. New project idea

- **Need industry / SME partners and partners who know about industry needs and demands**
- → Identification of application fields, particularly in automotive
- Numerical optimisation of process parameters with development of substitute models of the spot
- Development of cost-effective manufacturing processes
- Quasi-static and cyclic strength tests
- Corrosion studies

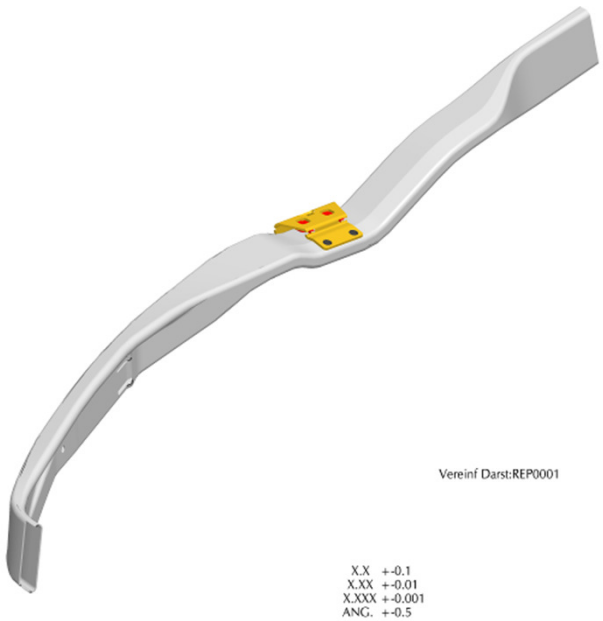


GLARE – ceramic rivet

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Hydrojoining – a new technology for forming and joining tubes

Fraunhofer-Institute for Machine Tools and Forming Technology

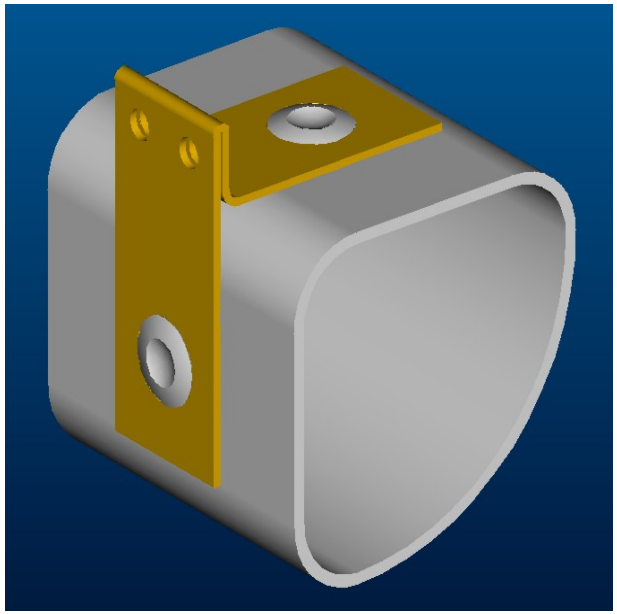


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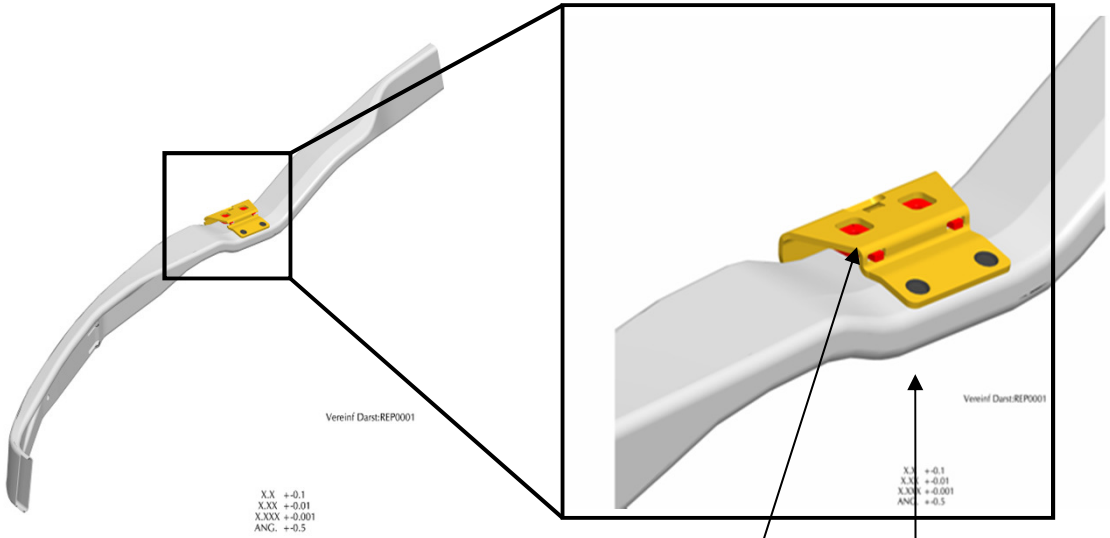
1. Motivation

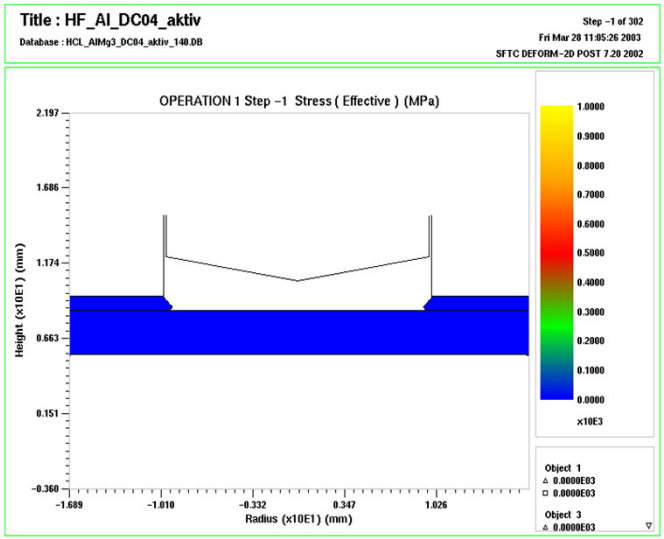
- Only one operation with best tolerances for hydroformed and joined assemblies
- For automotive components - for example
  - exhaust lines
  - space frame strategy

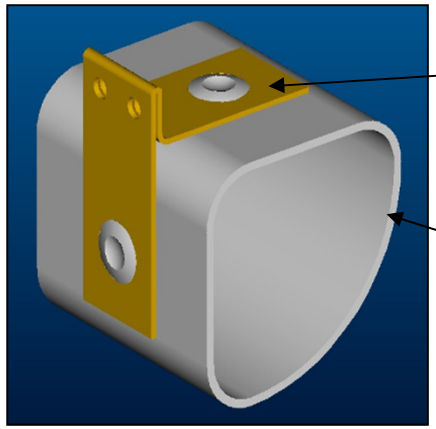


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2. Process

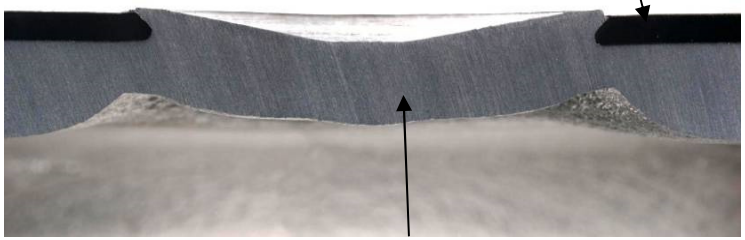






Joined part

Profile



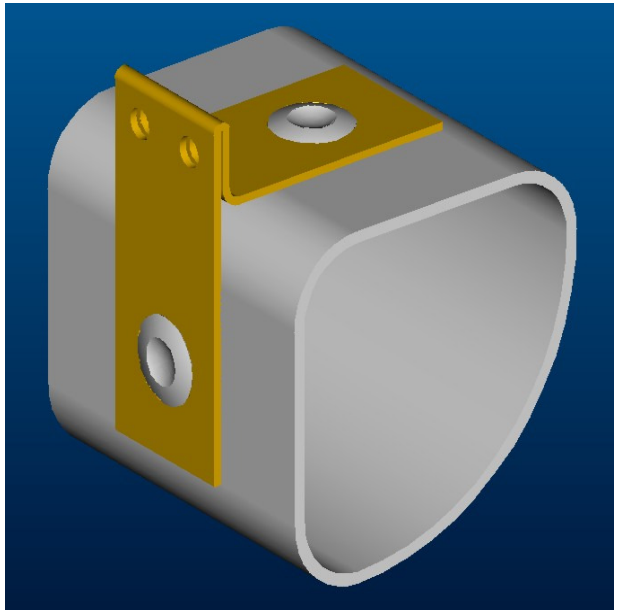
Steel

Aluminium

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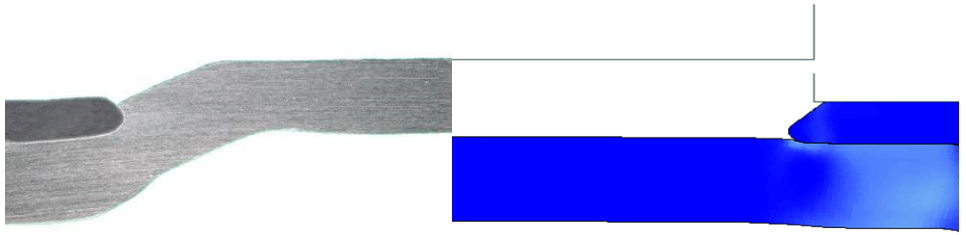
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2. Process

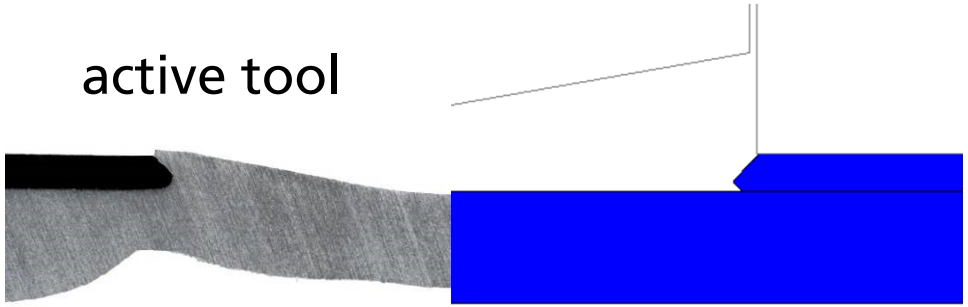


kinematic principle

passive tool



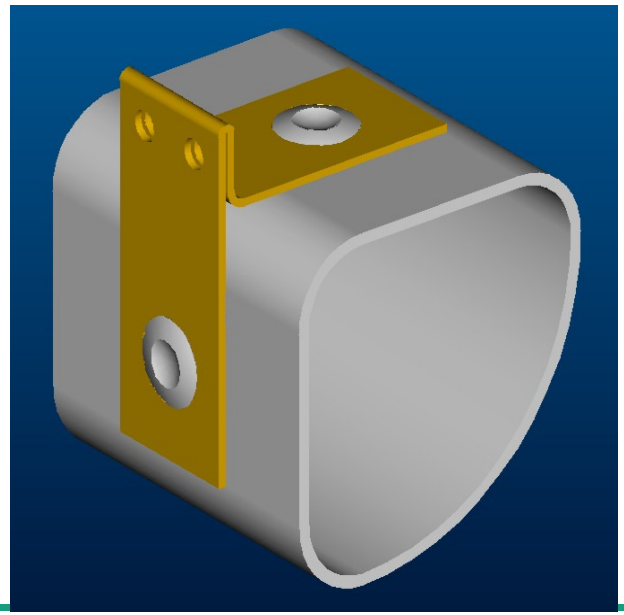
active tool



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3. Goal for a new project

- Definition of geometry and position of joining spots
- Forming simulation with local joining spots
- Optimization of process parameters
- Identification of application fields for
  - small-batch manufacturing, in order to reduce tolerances
  - avoiding complex process chains



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Fraunhofer IWU – Joining Technologies

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