Technical Data

- Type: M-Flex from the ExOne Company
- Lateral resolution: 64 μm
- Layer thickness: 100 μm
- Build volume (X,Y,Z): 400 mm x 250 mm x 250 mm
- Building speed: 3 – 12 mm per hour

Available Materials

**Metals**
- Diverse steel grades (optional infiltration with bronze)
- Ni-based alloys
- Tungsten (optional infiltration with Cu)

**Ceramics**
- Alumina (optional infiltration with Al, Fe, Ti or Cu)
- Silicon carbide (optional infiltration with Si)
- Tungsten carbide (optional infiltration with Co or Ni)

Please feel free to contact us:

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Fraunhofer-Center HTL is certified to acc. ISO 9001:2015
Fraunhofer-Center HTL develops cermet components for a range of industrial applications. Metal-ceramics composites are produced by using the entire powder metallurgy chain production:

- Raw material processing
- Powder optimization
- Forming
- Heat treatment
- Finishing
- Post-processing

The focus lies on the additive manufacturing process with which customized components made of various materials are designed and manufactured.

Using a modern powder-bed 3D-printer, which is based on the binder jetting technology, porous preforms of complex shapes are produced. In a subsequent densification step, the preforms are sintered or infiltrated with a molten metal.

### Binder Jetting Technology

In the binder jetting technology, components are printed layer-wise by selectively jetting a liquid organic binder into a powder bed. The printed parts are then cured in the oven and freed from unbounded powder. The unbounded powder is recycled and can be reused in further printing.

The components following the printing and curing operations are porous. At a final heat treatment step, the components are debinded and densified by sintering or by metal melt infiltration.

By combining the powder bed method and an inkjet print-head utilizing various binder liquids together with various infiltration materials, it is possible to additively manufacture complex prototypes and small batches in an enormous range of metal-ceramic material combinations.

### Summary of our service

- Identification of a metal-ceramic material combination for a specific industrial application
- Material property analysis via finite element methods
- Powder characterization and optimization (e.g. improvement of flowability)
- Inkjet-binder development (e.g. binder loaded with nanoparticles)
- 3D-printing of metallic or ceramic preforms
- Metal melt infiltration of preforms
- Sintering in a controlled atmosphere
- Optimization of heat treatments
- Microstructure characterization
- Non-destructive testing of printed parts
- Mechanical testing