## Service Offering

- **Consultancy** on AM methods (including NDA)
- **Development** of customer-specific devices
- **Production** of customer-specific AM devices
- **Special** devices for testing new processes: coating; lamination; winding; polymer spinning; prepreg production; debinding and sintering
- **Customer-specific** design of components (design for AM DfAM + design for ceramics )
- **Load-specific** design and topology optimization
- **Development** of AM processes and production of prototypes

Fraunhofer-Center HTL
is certified acc. to ISO 9001:2015

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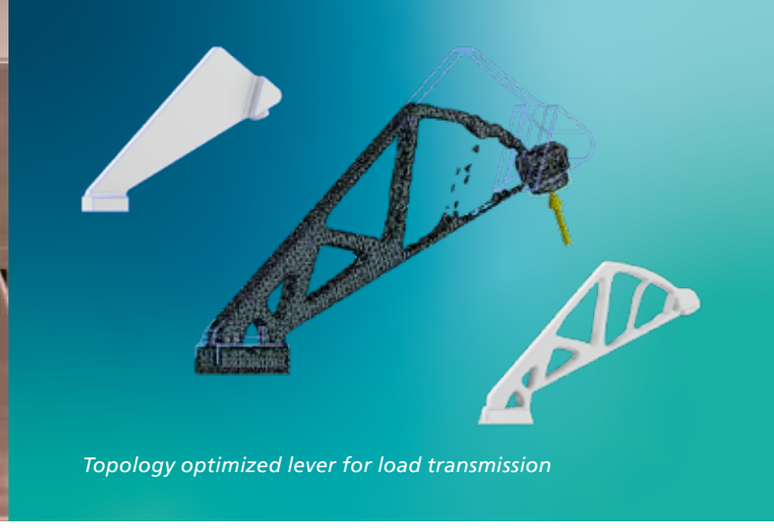
# Customized 3D Printer Development



*Topology optimized lever for load transmission*

## Additive manufacturing (AM)

Additive manufacturing offers the possibility of designing and manufacturing components based on functionality instead of manufacturing-related restrictions. To get the maximum benefit from this breakthrough technology, the ideal AM technique must be selected or developed taking into account the type of material being processed and the type of components being manufactured.

# Customized 3D Printer Development

Fraunhofer-Center HTL has longstanding experience in additive manufacturing (AM) and device development. Focus is on two-step processes where a green part is 3D printed in the first step and sintered in the second step. The HTL develops component designs, feedstocks, binders, inks, 3D printing parameters and 3D printers for the first step. It also develops heat treatment processes and measuring methods for the second step and final inspection of AM parts. The objective is sustainable AM processes for small and medium-scale production at reasonable cost and high quality. Customer needs are considered in the design of processes and devices:

- What tasks are to be performed?
- What are the operating requirements of the product?
- Which component shape and material is selected?
- Which raw materials and feedstocks are selected: resins, inks, slurries, powders, pastes?
- What are the demands concerning the fabrication process itself: building rates, throughput, flexibility, integration into existing process chains, quality management, invest and production cost?

## Free Flow Structuring (FFS)

A critical issue in all powder metallurgical processes is the forming process requiring homogeneous green compacts with sufficient density. Forming processes based on slurries enable a good dispersion of solid particles and achieve a high green density after drying. However, they require more sophisticated printing methods than powder bed printing using dry powders. 3D printers based on the layerwise build-up of slurries extruded from slot dies are a special development at Fraunhofer Center HTL. These free-flow structuring (FFS) devices enable a large building space and can be equipped with multi-material printing heads. The HTL constructs and delivers customized 3D printing devices, FFS as well as other two-step printers – according to customer requirements.

*Thermo-optical measuring system TOM_wave*

## Process and Component Design

Efficient component design is used, for example, to minimize production costs and maximize performance. In addition, through new technologies and the understanding of new materials, there are many new possibilities for the production of more efficient, lighter and more resilient components. Fraunhofer Center HTL helps in material selection and uses its broad experience in databases and thermodynamics – if required. It has expertise in the field of component design. This includes the construction of components for additive manufacturing (DfAM) using CAD tools and topology optimization. Besides mechanical loads also thermal loads can be considered.

Debinding and sintering of printed green components are process steps, which control throughput and product quality. At Fraunhofer Center HTL measuring furnaces and simulation methods are developed to optimize these thermal processes. Computed tomography is used as a powerful measuring tool to test net shape performance and homogeneity of green and sintered parts. We can produce prototypes from metals, ceramics and plastics.