



## FURTHER DEVELOPMENT OF THE PROCESSING OF COPPER ALLOYS BY SLM

### Task

In the last few years, Fraunhofer ILT has expanded the state of the art for the processing of copper alloys with SLM. Indeed, it has demonstrated that SLM can process the alloys CuCr1Zr and CuCrNi2Si. Moreover, the objective of achieving a density > 99.5 percent during processing has been achieved for these alloys. What has not yet been done, however, is to develop the process further in order to improve the surface quality and achieve higher resolution of the two alloys: these two factors pose an important challenge for the process so that it can be useful for the industry. Processing these materials faces two challenges: the alloy's high thermal conductivity and high degree of reflection for the laser radiation at a wavelength of  $\lambda = \text{approx. } 1 \mu\text{m}$ .

### Method

To improve component quality, Fraunhofer ILT has systematically varied the process parameters while also taking the microstructure and surface quality into consideration. In addition, it has examined different processing strategies.

### Results

The achievable surface quality for the processing of the alloys was reduced to  $S_A = \sim 10 \mu\text{m}$  from approx.  $S_A = 45 \mu\text{m}$  for vertically constructed walls. The minimum wall thickness was reduced from approx. 1 mm down to 0.3 mm. In addition, a shape tolerance in the range of  $\pm 0.1 \text{ mm}$  has been demonstrated by means of optical 3D measurements on various components.

### Applications

Copper and its alloys are predominantly used in the field of toolmaking and electrical engineering. In addition, special copper alloys have special corrosion resistance. Examples of where this further development can be applied are the production of water-cooled induction coils, special cooling structures and heat exchangers as well as the prototype manufacture of electrically conductive components.

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3 Lattice structure, strut diameter: 0.3 mm.

4 Induction coils built with SLM.