



## LASER CUTTING OF FIBER-REINFORCED PLASTICS

### Task

For fiber-reinforced lightweight components to find wider appeal in the industry, it is crucial that efficient process chains are developed to manufacture components made of these materials. Separation processes are often needed, both to cut the raw material and semi-finished parts as well as to trim the edges or cut holes of cured or consolidated parts in the final process steps. Laser cutting offers inherent advantages over mechanical separation processes or water-jet cutting thanks to its wear and force-free operation. The cutting process has to be designed, however, so that the thermal stress on the material at the cutting edge is minimal and the processing speed allows economical operation.

### Method

Since there is such a variety of materials and ways of processing fiber-reinforced plastics, the cutting process has to be adapted to the specific cutting job. In particular, the absorption properties and thermal behavior of the materials, described by e.g. thermal conductivity and transition temperatures, require precise adjustment of the processing strategy. In reinforced fiber-glass or dry CFRP fibers, therefore, cutting is conducted in one step, while in the case of CFRP components, the cut kerf is formed in several cycles.

### Result

The laser cutting process consistently produces high-quality cut edges. The use of lasers in the multi-kW range allows cutting speeds of several meters/minute. For example, a single-mode fiber laser can be used to separate components made of CFRP with 2 mm wall thickness at an effective speed of 15 m/min. The heat affected zone of the cut edge is  $< 200 \mu\text{m}$ .

### Applications

As the aviation and automotive industry are increasingly using this material, they spur on the development of efficient methods for cutting holes and trimming edges of CFRP and GFRP. Production in machine and container construction, leisure and sporting goods can also profit from the laser cutting process for FRP.

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3 Laser cutting of glass-fiber reinforced plastics (GFP).

4 Cut edge of a CFP profile.