

High-Performance Cutting and Drilling with the 400W Laser MicroJet Technology

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The Laser MicroJet® (LMJ) is the proprietary technology of Synova S.A. It is based on the coupling of laser light into a hair-thin laminar flow water jet, typically in the order of 25 to 100 microns in diameter. During cutting or drilling applications, the laser is used to ablate and melt the workpiece whilst the water jet serves the purposes of guiding, cleaning and cooling. This unique combination results in parallel kerf walls, reduced heat affected zone and absence of heat accumulation. Thanks to this technological advantage, the Laser MicroJet® is already utilized in numerous applications serving markets such as diamond, toolmaking, aviation or watchmaking.

In order to target markets involving larger workpieces, such as some branches of aerospace and automotive, increased process speed is required to provide reduced cycle times. We present here the latest results of the up-scaled version of our cutting and drilling system with a laser power of up to 400W in various materials (e.g. CFRP, silicon, steel).

The challenge is to preserve the advantages of the LMJ, i.e. high cut quality, while increasing the laser power to improve material removal rates (MRR). We show the beneficial evolutions of our system to take advantage of the increased laser power, for instance, the adjustment of the jet width. We also discuss the technological options to minimize the material impact, especially the adjustment of laser parameters and of heat mitigation methods.

With standard Synova configuration, MRR up to 13 mm³/min in Inconel718 had been achieved. By using laser power up to 400W, the processing speed was significantly improved, for instance structuring of Inconel718, MRR of up to 30 mm³/min has been demonstrated.