Remote cutting with ns pulsed fiber lasers can be enhanced by tailored processing strategies.

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Laser cutting is a well-established process that is used to profile cut most sheet metal. This is typically based on using cw 1 µm fiber lasers with a coaxial assist gas and is widely recognised as the industry standard. The use of scanner-based cutting is also well known and has the advantage of not requiring a process assist gas and can benefit from the high-speed beam manipulation enabling fast cutting speeds on thin materials. Although cw lasers can be used for remote cutting there is a growing use of ns pulsed fiber lasers for these applications. Even though these lasers typically have less than a few millijoules (mJ) of pulse energy they can deliver peak powers >10kW and with average powers increasing in recent years up to 600W, they pack an impressive punch.

These lasers have carved out a growing number of niche applications in which they have demonstrated exceptional capabilities, such as the cutting of battery foils for Li-ion batteries and in the cutting of highly reflective metals in the jewellery industry.

The high beam quality of these sources produces the small focal spot sizes required to ensure sufficient energy density to enable melting and vaporisation of the substrate material. Using single line scans with sufficient pulse overlap thin foils can be readily cut with high quality. Thicker materials require a multi-pass approach, but this has limitations as the process is self limiting. To enhance the thickness capability, tailored processing strategies using optical scanning techniques are required that widen the cut kerf to maintain the incident energy density within the cut kerf.

In this paper we explore the cutting capabilities of the 600W source and discuss the impact of pulse parameters and machining strategies for a broad range of metals, including an assessment of the cut quality that can be achieved.