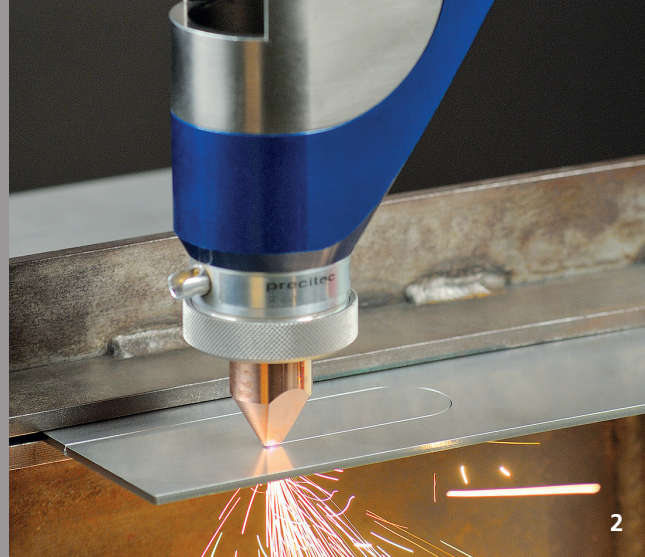




1



2

DIRECT DIODE LASER FOR CUTTING APPLICATIONS

Task

Fiber-coupled diode lasers are among the most cost-effective and efficient beam sources for cw laser applications and are widely used for applications requiring medium brightness such as hardening, soldering and welding of metals. The EU-funded research project »BRIDLE« aims to develop novel, cost-effective diode laser beam sources to open up applications that place high requirements on brightness, such as the cutting of metals.

Method

Within the framework of »BRIDLE«, laser diodes optimized for maximum brightness were developed and integrated into commercial pump modules, which have been manufactured fully automated by the project partner DILAS. These modules were wavelength stabilized by means of volume Bragg gratings. The radiation was then combined with the aid of cost-efficient dielectric edge filters with a small distance of the central wavelength and coupled into an industrial fiber. The filters enable a comparable small spectral spacing of 4 nm.

- 1 Pump diode laser module with dense wavelength combination.
- 2 Cutting stainless steel with a direct diode laser.

Results

The diode laser system reaches an output power of 800 W with a beam parameter product of 8.5 mm mrad and achieves a combining efficiency of 95 percent for the partial beams. It is possible to scale the output power even further – up to 2 kW with a beam parameter product of 6 mm mrad. The system has successfully cut stainless steel plates with thickness of up to 4.2 mm. The cutting quality corresponds to results obtained with fiber lasers having comparable output power. The approach investigated here makes it possible to scale the brightness of existing sources cost-effectively by a factor of ten when standard components are used.

Applications

Direct diode lasers with an optical output power in the kW range and a beam parameter product smaller than 10 mm mrad represent a cost-effective alternative to fiber lasers in cutting applications. Alternatively, the stabilized emission spectrum and the high beam quality of the diode laser can be used to a great advantage in technically demanding pump applications, e. g. multi-kW fiber lasers or ultra-short pulse lasers.

The work has been funded within the framework of the EU project »BRIDLE« under the grant number 314719.

Contact

Dr. Thomas Westphalen
Telephone +49 241 8906-374
thomas.westphalen@ilt.fraunhofer.de

Dipl.-Ing. Dipl.-Wirt.Ing. Martin Traub
Telephone +49 241 8906-342
martin.traub@ilt.fraunhofer.de