

Dynamic Beam Laser for welding applications

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Dynamic Beam Lasers (DBL) leverage Coherent Beam Combination and Optical Phased Array technology, providing unique features for diverse applications, including laser welding. The advanced capabilities of DBL include: (1) generating arbitrary beam shapes, (2) controlling the frequency of beam shapes, similar to a wobble effect, (3) creating sequences of beam shapes, (4) focus steering, which moves the focal plane along the Z axis, and (5) producing high brightness beams that enable remote operation and control of beam diameter according to the focal length used.

These capabilities allow for precise control thermal gradients, both spatially and temporally, significantly influencing the fluid dynamics during the welding process. This control enables the optimization of weld geometry, stability of the melt pool and keyhole, and the solidification process. Recent developments utilizing these features have shown improvements in laser welding processes, such as dynamically changing the beam orientation and electro-optically correcting the focal plane location when using a galvo scanner. These innovations reduce the need for mechanical focus adjustments and enhance overall welding performance.