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WHITE PAPERS & APPLICATION NOTES



Measuring High Power Lasers

Introduction

Since cavemen first figured out how to throw rocks and shoot arrows, our ability to precisely deliver power has come a long way.

High-power laser beams, by delivering a lot of power into a small and precisely controlled space, now help us manufacture components that would have been difficult – if not impossible – using purely mechanical means. Automotive and aircraft manufacturers, shipbuilding, and similar heavy-industry applications have been dramatically changed by the ever-advancing capabilities of laser technology.

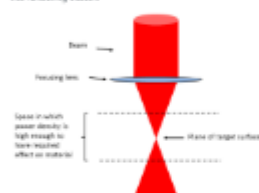
Processes requiring less dramatic power levels also benefit: a single high-power beam can be “shared” among multiple parallel processing stations – and because they all use what started as a single beam, there can be much better uniformity and process control across these multiple stations.

“Exotic” applications such as military directed-energy weapons, once of real interest only to sci-fi authors, are now reaching maturity. Experts often mentioned the “magic number” of 100W, the power level needed to make such things practical. Thanks largely to advances in fiber lasers and their scalability, industrial materials-processing systems operating at 500W and even 75kW are almost standard items now.

Measuring: Why and How

Why

A laser process is designed to bring the beam to the needed power density in a precisely controlled location. Consider the following cases:



Measuring High Power Lasers

High-power laser beams deliver a lot of power into a small, precisely controlled space. Parameters that are not controlled can unexpectedly change what the process is doing and where. The way to prevent this is to monitor the relevant parameters of the beam with an appropriate level of accuracy to catch drift before it becomes a problem and deal with it proactively. We take a deeper look at measuring power density and focus location/shape, and the challenges related to cooling, damage, backscatter, industrial environments, and increasing power levels.

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