



**PRODUCTS FOR LASER BEAM ANALYSIS**  
IN ADDITIVE MANUFACTURING



# Layer by Layer

How we achieve high-precision measurements of the laser beam in your 3D system

The technology is still new, yet it has initiated a revolution in production halls. The ability to digitally reproduce shapes using 3D printing and “conjure up” three-dimensional parts practically without tools just by building them up layer by layer has broken the mold for traditional production processes. The more complex a component is, the more economic it will be to produce it using additive processes, whether it be a dental prosthesis, a turbine unit, or replacement parts for a car.

Making the next step into mass production, however, requires adherence to the most exacting requirements for process precision and quality assurance simultaneously with ISO conformity. On the one hand the use of lasers provides the maximum flexibility in producing complex parts. On the other hand new challenges such as lack of space, excess heat and various angles of incidence of the laser light come into play. This makes it difficult for the measuring devices currently used in additive manufacturing to achieve thorough laser beam diagnostics.

In order to meet the growing needs of this market, we have developed the PRIMES **ScanFieldMonitor** and along with it a patented<sup>1)</sup> measuring procedure for additive manufacturing processes. Not only does the new device measure beam propagation parameters such as focus position, focus radius, and Rayleigh length, it also provides a lot of additional valuable information on the dynamics of your laser machine.

Learn more about our device range for Additive Manufacturing applications on the following pages or on our website.

<sup>1)</sup> PRIMES is the owner of US patent 10,184,828 which protects a method for determining properties of a laser beam. The SFM is a sophisticated tool that makes it easier for you to implement this method.

# Measuring in a Confined Space – The ScanFieldMonitor



## All-in-One: All Measuring Tasks in One Device

The ScanFieldMonitor (SFM) can measure the beam propagation parameters and several machine characteristics. This saves the user time and money, regardless of whether you're a mechanical engineer commissioning and maintaining AM machines or a user managing processes and quality.

The compact measuring unit combined with its wireless communication module enables you to identify properties at arbitrary positions in the working area under actual process conditions.

## The Key Benefits

- ① The SFM gives access to relevant process parameters besides the range of conventional beam diagnostic devices, such as marking speed or beam analysis in various positions on the entire build plate.
- ② Combining separate applications for various calibration tasks into a single device, the SFM cuts down on investments, complexity, and work time.
- ③ Measurements can be taken under actual operating conditions for laser sintering: laser power and inert gas atmosphere.
- ④ With the ScanFieldMonitor you gain a compact, powerful service tool suitable for comprehensive on-site scanner analysis.

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# A Class of its Own – The Cube M

## Measuring Very High Power Densities? No Longer a Problem

The new Cube M by PRIMES enables measurements up to a power density of 250 kW/cm<sup>2</sup> at power levels ranging from 25 W to 2 kW!

This latest measuring device is designed to measure laser power of high quality lasers even in the smallest of spaces that usually do not accommodate a measurement device. Thanks to the special micro lens array, designed by PRIMES, the Cube M enables measurements in the working plane of an AM machine, directly in focus position.



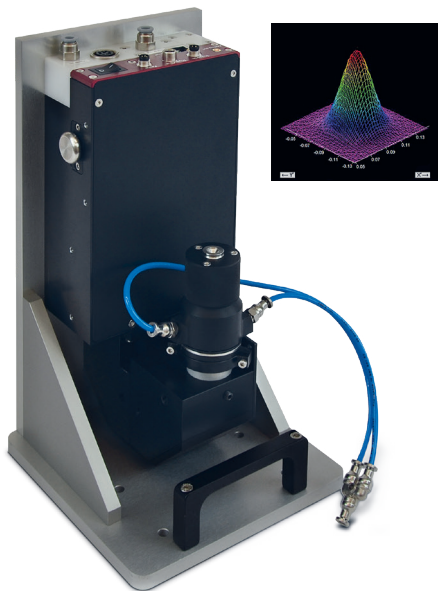
Additionally, deviations of the beam incidence of  $\pm 20^\circ$  in relation to the vertical are viable. Thus, the Cube M is perfectly suited to use in AM applications.

## The Key Benefits

- 1 The compact design of just 60 x 65 x 80 mm enables the use of the Cube M in places within your system that might normally be out of the question.
- 2 Do more than just record power changes at your laser source, be certain of the entire optical path through to the workpiece.
- 3 The first device in the market, that can measure at oblique beam incidence.
- 4 Specialized for high-performance applications with highest power densities of up to 250 kW/cm<sup>2</sup>.
- 5 Easy and straightforward: Mobile measuring via bluetooth, no need for external cooling.



# Optimized for Micro-Machining Systems – The MicroSpotMonitor-Compact



## Your Beam Parameters always in View

The camera-based focus analysis system MicroSpotMonitor-Compact is specially designed for use in tight spaces in micro-machining systems and can be modularly expanded to meet your requirements.

Optimized for small foot prints, the MSM-C including overhead mounting can be used to determine the beam propagation of your focused laser. It will help you improve your process and keep production quality on a

constant high level. The compact device does not have its own movement axes. In connection with a laser processing system, however, caustic measurements, which are in conformity with current standards, can be carried out easily.

Typical focus diameters ranging from 20 to 100  $\mu\text{m}$  of single mode fiber lasers can be measured.

## The Key Benefits

- ① Modularly adaptable to your process by accessories such as overhead mounting and 90° beam deflection.
- ② From manual to fully automatic, a variety of operating modes are available.
- ③ Space-saving dimensions of just 230 x 120 x 60 mm for a camera casing with electronics, attenuation, and power absorbers.
- ④ Can be fully integrated into the system controller, enabling you to directly control and adjust the beam parameters in your system. Using the optional PROFIBUS® interface with or without PC connection, the MSM-C can be controlled directly from your laser machine.

# The Specialist for Laser Beam Measurement – The FocusMonitor FMW+

## Efficient and advanced: Measuring the Focus at High Beam Power

The FocusMonitor FMW+ is a scanning diagnostics system specialized for the analysis of continuous wave laser beams with low up to high laser beam powers. It is used for the analysis of laser beam sources for laser material processing in laser beam welding, cutting as well as surface processing.

As a perfect measuring instrument for focused beams, the FocusMonitor FMW+ provides all relevant measured values with highest accuracy. In addition to the geometric dimensions of the focused laser beam, the focal position in space, the beam parameter product and divergence are determined.

This compact version of the proven FocusMonitor features new electronics and an absorber for laser power up to 1 kW.

Both NIR and CO<sub>2</sub> laser radiation can be measured. For this it only needs a conversion of measuring tip and detector.

## Enhanced Functionality Thanks to new LaserDiagnosticsSoftware

In combination with the analytical features provided by the new LaserDiagnosticsSoftware, the FocusMonitor FMW+ offers considerably more functionality than ever before. Additionally to faster data communication via Ethernet, it also allows for semi-automatic or manual measurement of power density distribution in keeping with innovative standards for the measurement of beam position and beam dimensions.



# PRIMES – A leading company for laser beam diagnostics.

We offer innovative and process-optimized measuring devices for focus characterization and performance measurement of laser beams. Our broad spectrum of high-precision, durable products is put to use in numerous industrial applications as well as for research and development. System characterizations or error analyses can be carried out. Founded in 1992 and based in the Rhine-Main region in Germany, today the company is an important player on the global market, where it is represented by 12 distributors and a new subsidiary in Japan.



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