

# FocusMonitor FMW+



Fiber and disc laser



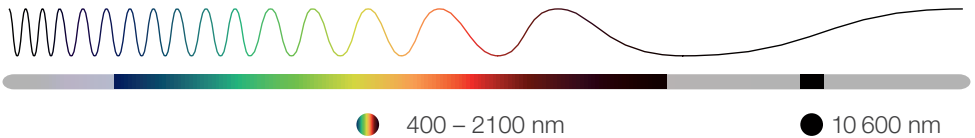
Diode laser



Ultrashort pulse laser



CO<sub>2</sub> laser



**The most versatile all-in-one solution for various laser based AM machines**



Caustic



Raw beam



Power



Beam profile



Pointing stability



Vector



Focus shift

POWER RANGE	Up to 1000 W
BEAM QUALITY	Single Mode – Multi mode
BEAM DIAMETER	100 – 3000 μm
SPECIAL FEATURE	Integrated beam absorption
INTERFACES	Ethernet

# Tech Corner



The FMW+ is an opto-mechanically scanning measuring system that scans the laser beam with a special measuring tip. This is provided with a small hole (typical diameter 20  $\mu\text{m}$ ) that lets through a small section of the laser beam.

Two reflecting mirrors guide this portion of the laser light to a detector selected and configured depending on the used wavelength.

By moving the rotary disk forth the power density distribution of the focused laser is captured at high resolution.

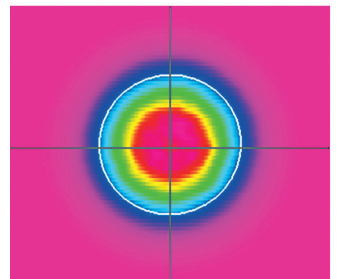
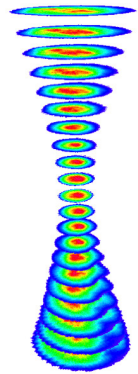
The high orbital velocity of the rotating measuring tip facilitates analysis of high power densities. To create a caustic consisting of multiple beam distributions along the propagation, the build platform of the L-PBF machine is used.

A very high signal-to-noise ratio is achieved thanks to the dynamics of the used analog-digital-converter. Very low and high intensities can be displayed with equal precision. This is one of the requirements for measurements of caustics near to the focal point, over at least four Rayleigh lengths (ISO 11146).

The FMW+ has been specifically designed to meet the current requirements of additive manufacturing machines.

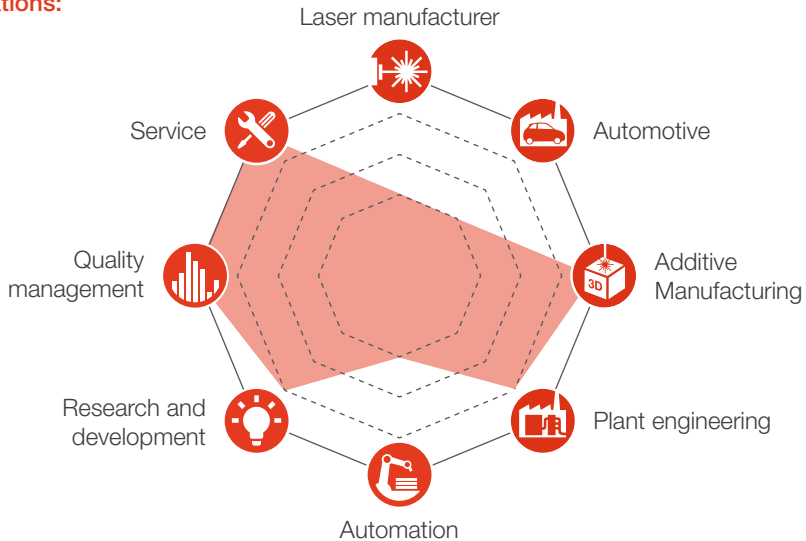
The unit is easy to set up as it requires no external cooling or gas supply. In addition, the user can replace the tip and detector themselves in no time.

The special absorber design allows to absorb energy up to 90 kJ. A 400 W laser can therefore be measured for up to 4 minutes at full power.



MEASUREMENT PARAMETERS		FMW+
Power range	up to 1 000 W	
Wavelength range	0,4 - 12 $\mu\text{m}$ (depending on detector and measuring tip)	
Beam dimensions, typ.	100 – 3 000 $\mu\text{m}$	
Max. energy per measurement	90 kJ	
Max. power density at different measuring tips	CO <sub>2</sub> laser (10 600 nm) Nd:YAG laser (1 000 – 1 100 nm) VIS laser (515 – 550 nm) Diode laser (400 – 1 000 nm)	30 MW/cm <sup>2</sup> 10 MW/cm <sup>2</sup> 5 MW/cm <sup>2</sup> 1 MW/cm <sup>2</sup>
DETERMINED PARAMETERS		
Focus position x, y, z	yes (with external z-axis possible)	
Focus radius x, y		
Beam quality factor M <sup>2</sup>		
Raw beam diameter with focussing element		
Beam parameter product BPP		
Divergence angle		
Power density distribution	2D, 3D	
DEVICE PARAMETERS		
Measurement window sizes	0.1 x 0.1 up to 8 x 8 mm	
Resolution	32 x 32 pixel – 1 024 x 1 024 pixel	
Rotation speed	1 875, 3 750 rpm	
SUPPLY DATA		
Power supply	24 V DC $\pm$ 5 %, max. 1.8 A	
COMMUNICATION		
Interfaces	Ethernet	
DIMENSIONS AND WEIGHT		
Dimensions (L x W x H) Height with the carrying handle folded down	185,5 x 153 x 237,5 mm 208,5 mm	
Weight (approx.)	8 kg	

## Applications:



**System description:** The FocusMonitor FMW+ is a versatile opto-mechanically scanning diagnostics system configured to meet the requirements of various AM machines. **It directly measures power density distributions of focused laser beams from the far infrared to the blue spectral range.**

**Your benefit:** The FocusMonitor FMW+ is a state-of-the-art toolbox to reliably determine beam properties, geometric dimensions, focal position, beam parameter product and entire caustics of focused laser beams. The fast and easy exchange of the measuring tip enables the FMW+ to measure different laser beam sources and systems solely by selecting the optimal measuring tip and corresponding detector. Together with an integrated absorber in its rugged and compact housing, the FMW+ is the perfect solution for service, maintenance and quality assurance.

## CONCLUSION

The FocusMonitor FMW+ is a highly versatile toolbox with easily interchangeable measuring tips and detectors, which enables to determine focused laser beams from the far infrared to the blue spectral range. This makes it highly recommended for the use in laser based AM processes.



For further information please visit [www.primes.de/fmw+](http://www.primes.de/fmw+)