

FocusMonitor FM+



Fiber and disc laser



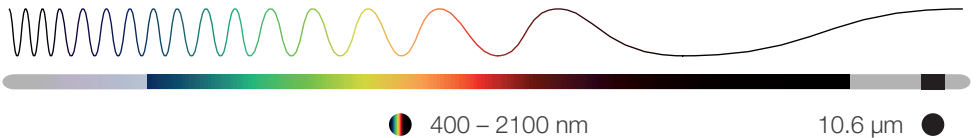
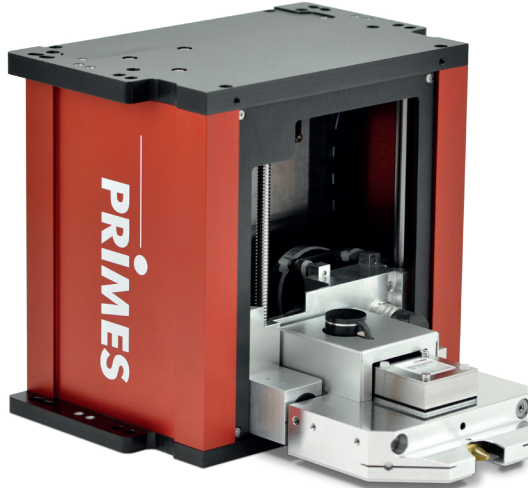
Diode laser



Ultrashort pulse laser



CO₂ laser



The established standard in high power laser beam diagnostics.



Caustic



Raw beam



Power



Beam profile



Pointing stability



Vector



Focus shift

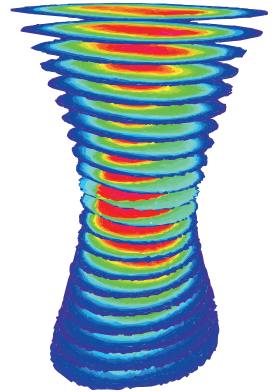
POWER RANGE	30 W – 100 kW
BEAM QUALITY M ²	Single Mode – Multi Mode 1 to >100
BEAM DIAMETER	Focused 100 μm – 5 mm
SPECIAL FEATURE	Auto caustic, Linescan
INTERFACES	Ethernet

Tech Corner

The FM+ is an opto-mechanically scanning measuring system that scans the laser beam with a special measuring tip. This tip is equipped with a small hole (typically with a diameter of approximately 20 μm), letting through only 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 and gradually leveling the complete unit upward, a caustic consisting of multiple power density distributions is created. The high orbital velocity of the rotating measuring tip facilitates the analysis of high power densities.

A very high signal-to-noise ratio is achieved thanks to the dynamics of the analog-digital converter used. Very low intensities are shown with equal precision next to the high peak intensities. That is one of the requirements for automatically measuring caustics in the area near the focal point over at least four Rayleigh lengths in accordance with ISO 11146.



To meet the requirements of constantly increasing power levels and beam qualities PRIMES is offering a unique addition: **The FS³ (Fused Silica Sensor System)**

As the latest innovation in the FocusMonitor FM+ family, PRIMES introduces the FocusMonitor FM+ HPD. Through continuous development and the special design of the new measuring principle FS³, it is now possible to measure and evaluate laser beams with very high power densities of up to 50 MW/cm². Beam diameters of 100 μm – 1 200 μm can be evaluated. The revolutionary design and the new functionality of the FM+ HPD are available for beam sources in the wavelength range of 1.0 – 1.1 μm .

With the FM+ HPD, we present a milestone in the caustic analysis of laser beams in previously difficult to evaluate power ranges, which find use in cutting applications, for example.



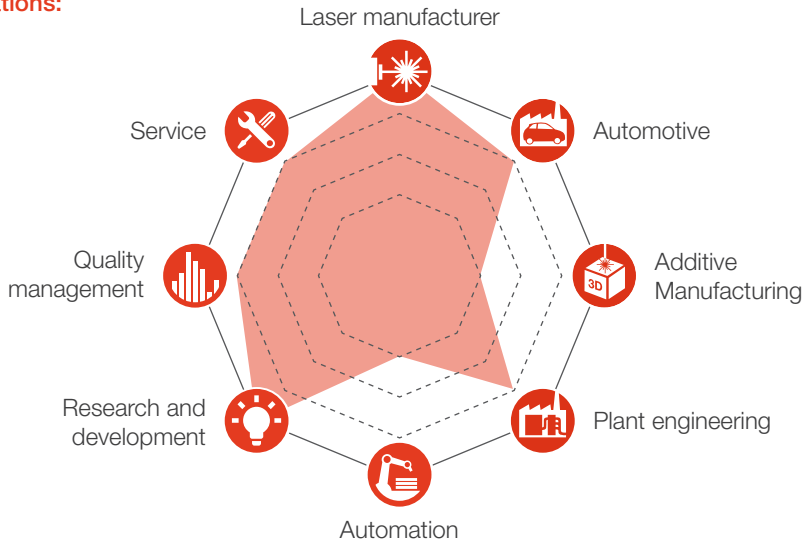
MEASUREMENT PARAMETERS		
	FM+	FM+ HPD
Power range	30 – 25 000 W ¹⁾	30 – 25 000 W
Wavelength range	0.4 – 12 µm	515 – 545 nm 1 000 – 1 100 nm
Beam diameter	100 – 3 000 µm (up to 5 000 µm optionally)	100 – 1 200 µm ³⁾
Max. power density at different wavelengths	CO ₂ laser (10.6 µm): 30 MW/cm ² Nd:YAG laser (1 000 – 1 100 nm): 10 MW/cm ² VIS laser (515 – 550 nm): 5 MW/cm ² Diode laser (800 – 1 000 nm): 1 MW/cm ²	NIR laser: 50 MW/cm ²
Max. beam divergence (depending on measuring tip)	NIR high div: 200 mrad Diode: 500 mrad CO ₂ high power: 240 mrad	120 mrad
DETERMINED PARAMETERS		
Focus position x, y, z	yes	yes
Focus radius x, y	yes	yes
Beam propagation ratio M ² (BPP)	yes	yes
Divergence angle	yes	yes
Power density distribution	2D, 3D	2D, 3D
DEVICE PARAMETERS		
Working range x-y	8 x 8 mm (12 x 12 mm optional) ²⁾	8 x 8 mm
Working range z	120 mm	120 mm
Resolution	32x32 px – 1 024x1 024 px	32x32 px – 1 024x1 024 px
Rotation speed	1 875, 3 750, 7 500 min ⁻¹	1 875 min ⁻¹
Linescan	yes	yes
SUPPLY DATA		
Power supply	24 V DC ± 5 %, max. 3.5 A	24 V DC ± 5 %, max. 3.5 A
Inert gas (water and oil free)	Helium, Nitrogen or Argon	Helium, Nitrogen, Argon, compressed air
Pressure inert gas	typ. 0.5 bar	typ. 0.5 bar
COMMUNICATION		
Interfaces	Ethernet, RS485	Ethernet, RS485
DIMENSIONS AND WEIGHT		
Dimensions (L x W x H)	280 x 242 x 218 mm	318 x 242 x 218 mm
Weight (approx.)	8.5 kg	8.5 kg

¹⁾ Higher power ranges on request.

²⁾ Larger working ranges on request.

³⁾ The size of the beam distribution to be measured must not exceed 1 200 µm in the 86 % power inclusion. Within this range, measurement of multispots is also possible.

Applications:



System description: The FocusMonitor FM+ is a versatile opto-mechanically scanning diagnostics system for the analysis of focused laser beams from the far infrared to the blue spectral range. **It directly measures power density distributions of high power lasers and does therefore allow a comprehensive evaluation of complete setups at full power.**

Your benefit: The FocusMonitor FM+ is a state-of-the-art toolbox to reliably determine beam properties, geometric dimensions, focal positions, beam parameter products, beam quality factors and entire caustics up to four Rayleigh lengths of focused laser beams. The fast and easy exchange of the measuring tip enables the FM+ to measure different laser beam sources and systems solely by selecting the optimal measuring tip and corresponding detector.

CONCLUSION

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



For further information please visit www.primes.de/fm+