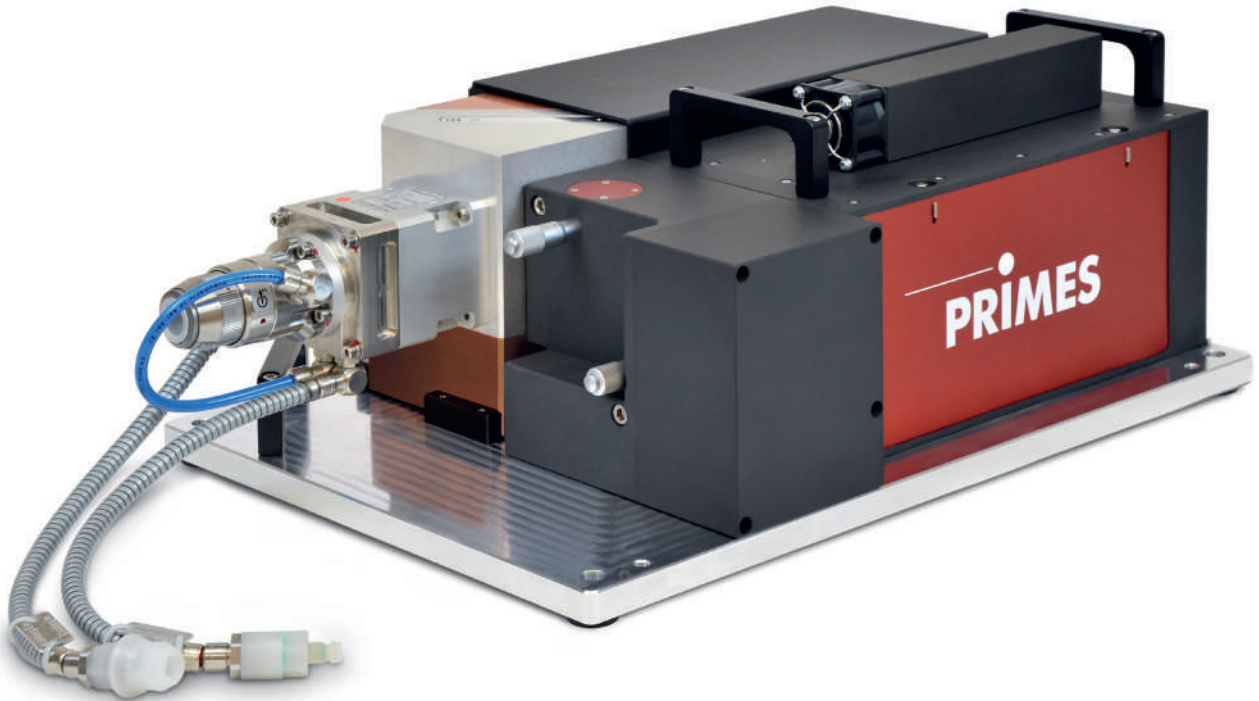




LaserQualityMonitor LQM+



Safety First for Laser Manufacturers

Fast & safe: The LaserQualityMonitor LQM+ is the perfect measuring device for automatically determining the beam parameters of a beam source. The measuring system is compact, easy to adjust, easily customizable, and offers measuring methods that go above and beyond the current market standards. We believe these are the perfect conditions for companies producing laser light sources.

With the LQM+, PRIMES provides an integrated solution for fast, simple analysis of a beam of lasers. Not only does it measure, characterize, and qualify the beam propagation of lasers from the UV to NIR range, but it also allows you to more easily analyze errors in the optical design of resonators and beam display systems.

One very common area of application for the LaserQualityMonitor is in quality assurance for the production of laser light sources.

Impressive Concept

The LaserQualityMonitor LQM+ directly measures the power density distribution of a focus geometry generated by an integrated focusing lens. That and its compact design makes this system so popular and successful on the market. Advantages of this measuring method: Disruptions caused by diffraction patterns, misalignment, asymmetries, and other effects are immediately visible in the measured power density distributions.

Automated parameter measurement in strict conformity to the ISO 11146 standard can be performed very quickly with this measuring device. The LQM+ is positioned directly in front of the laser to be measured and aligned toward the laser beam. All optical components and measuring features are integrated into its basic system. With attachment modules, a beam splitter, absorber, and alignment unit can be added at any time and thus increase its capacity to deal with power levels up in the multi-kilowatt range. The water-cooled absorbers are each equipped with integrated modules for measuring the



laser power. Fiber holders, collimators, neutral-density fiber inserts, and additional measuring objectives are available as necessary.

The Principle

Background: Characterizing the properties of a collimated laser beam with Rayleigh lengths of typically 10 meters requires a lot of work because of the very long measuring paths of 3 – 6 Rayleigh lengths. This generally makes it impossible to perform this type of measurement due to space constraints. ISO 1146 therefore recommends alternatively measuring a caustic created by focusing in order to determine the beam quality factor M^2 .

The LQM+ generates this caustic internal to the device by focusing the collimated laser beam shining in. The focused beam passes through multiple integrated attenuators and a lens to appear magnified on the CCD chip. Using the two-dimensional power density distribution, the new LaserDiagnosticsSoftware determines the radius, location, and alignment of the beam. It is through this process of setting up and repeating measurements at different positions in the device that all parameters necessary to describe the artificial caustic are determined. The electronic exposure time control of the CCD chip expands the system's dynamic area. As a result of this, it generally isn't necessary to adjust the filter during a measurement.

By focusing and characterizing the laser beam, it is possible to shorten the measuring path from several meters to a few millimeters. This makes it easy to determine the M^2 value, since it is possible to ensure that the optical setup used for focusing will not produce any aberrations that could influence the measured beam. The values of the beam parameters from the focused laser beam are used to derive the values of the collimated beam as specified in ISO 1146.

The new Features of the LQM+

- ① Accelerated measurement
- ② Completely automated caustic scan
- ③ Operation and presentation with the new PRIMES LaserDiagnosticsSoftware
- ④ Optionally available for up to 20 kW
- ⑤ Integrated power measurement in the versions LQM+ 500, LQM+ HP10 and LQM+ HP20

Beam Parameters

- Focal point/focus in relation to the beam entrance in the LQM+
- Beam radius
- Far field divergence
- Rayleigh length
- Divergence
- Beam quality factor M^2



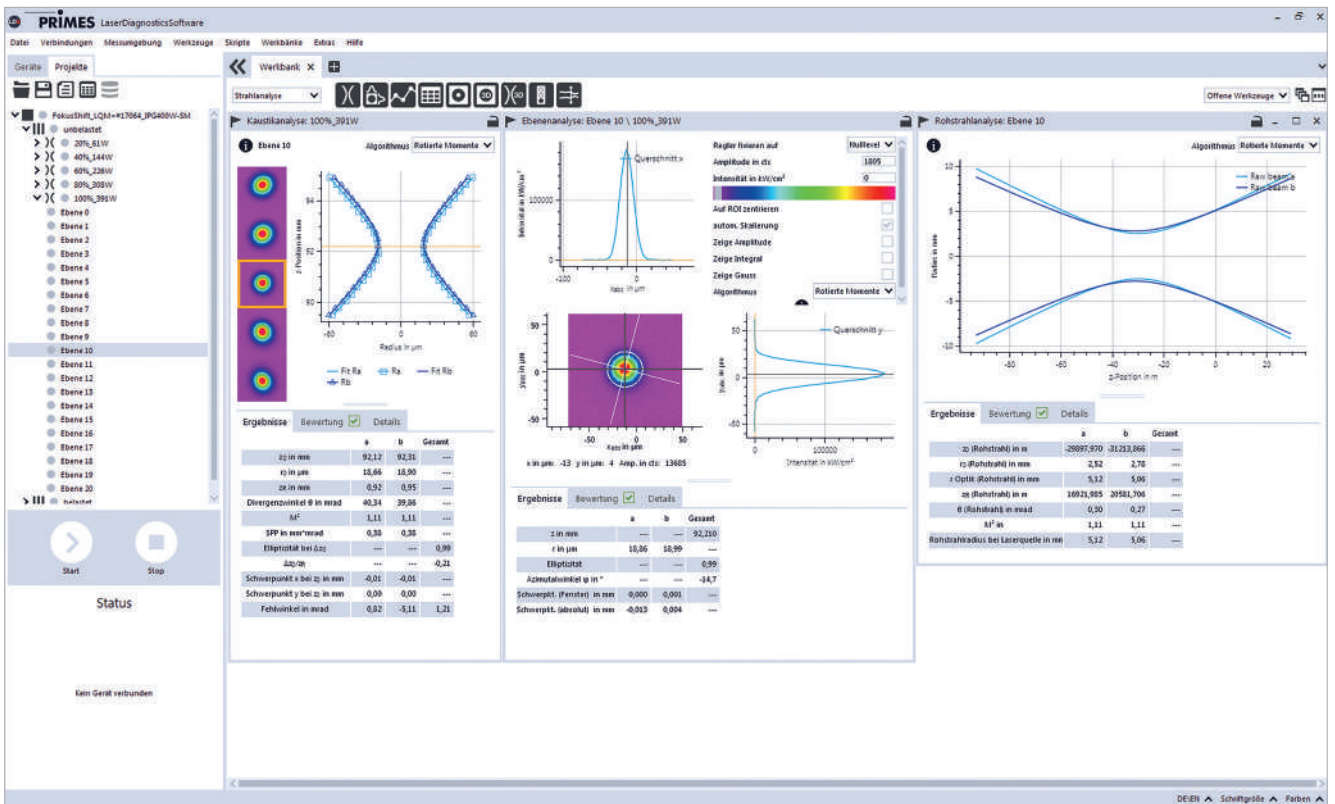


Diverse Models & Options

- Tool holder for collimators with 35 and 40 mm outer diameter
- Collimators with 67 mm focal length up to 6 kW and fiber connectors LLKD and QBH
- Measuring objective 1:1, 5:1 and 1:2
- Wavelength range: 1 030 – 1 090, 515 – 545 and 340 – 360 nm
- Neutral-density filters OD1, OD2, OD3, OD4, OD5

The Key Benefits

- 1 Full caustic measurement in a few seconds
- 2 Fully automated measurement of M^2 value
- 3 Laser qualification in accordance with ISO 11146 in a few seconds
- 4 Easy operation thanks to programmed user prompts
- 5 Integrated solution, optionally expandable



Presentation of typical measuring results of the LQM+ within the new LaserDiagnosticsSoftware



Technical Data

	LQM+ 20	LQM+ 200/500	LQM+ HP10	LQM+ HP20
MEASUREMENT PARAMETERS				
Power range (for 1064 nm)	20 W	200 W (opt. 500 W)	3 kW (single mode) 10 kW (multi mode)	5 kW (single mode) 20 kW (multi mode)
Pulse duration	100 fs – cw	100 fs – cw	100 fs – cw	100 fs – cw
Wavelength range	340 – 360 nm 515 – 545 nm 1 030 – 1 090 nm	340 – 360 nm 515 – 545 nm 1 030 – 1 090 nm	532 nm on request 1 030 – 1 090 nm	1 030 – 1 090 nm (NIR)
Beam dimensions Single mode Multi mode	1.5 – 9 mm 1.5 – 15 mm	1.5 – 9 mm 1.5 – 15 mm	1.5 – 9 mm 1.5 – 15 mm	14 – 16 mm (single mode) 18 – 22 mm (multi mode)
Beam quality factor M^2	1 - 50	1 - 50	1 - 50	1 - 50
Max. beam divergence	10 mrad	10 mrad	10 mrad	10 mrad
DETERMINED PARAMETERS				
Power density distribution	2D, 3D	2D, 3D	2D, 3D	2D, 3D
SUPPLY DATA				
Power supply	24 V DC \pm 5 %, max. 1.8 A	24 V DC \pm 5 %, max. 1.8 A	24 V DC \pm 5 %, max. 1.8 A	24 V DC \pm 5 %, max. 1.8 A
Cooling	air cooling	air cooling (opt. water cooling)	water cooling	water cooling
Cooling water pressure	–	2 bar primary pressure with an unpressurized outflow, max. 4 bar		min. 4 bar
Recommended Cooling water flow rate	–	1.5 l/min	7 – 8 l/min	18 – 20 l/min
Cooling water temperature $T_{in}^{1)}$	–	Dew point temperatur $< T_{in} < 30$ °C		
COMMUNICATION				
Interfaces	Ethernet	Ethernet	Ethernet	Ethernet
DIMENSIONS AND WEIGHT				
Dimensions (L x W x H)	285 x 190 x 180 mm	350 x 230 x 190 mm	480 x 300 x 190 mm	495 x 320 x 190 mm
Weight (approx.)	10 kg	18 kg	35 kg	40 kg
ENVIRONMENTAL CONDITIONS				
Operating temperature range	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C
Storage temperature range	5 – 50 °C	5 – 50 °C	5 – 50 °C	5 – 50 °C
Reference temperature	22 °C	22 °C	22 °C	22 °C
Permissible relative humidity (non-condensing)	10 – 80 %	10 – 80 %	10 – 80 %	10 – 80 %

¹⁾Please consult with PRIMES before doing anything that does not comply with this specification.