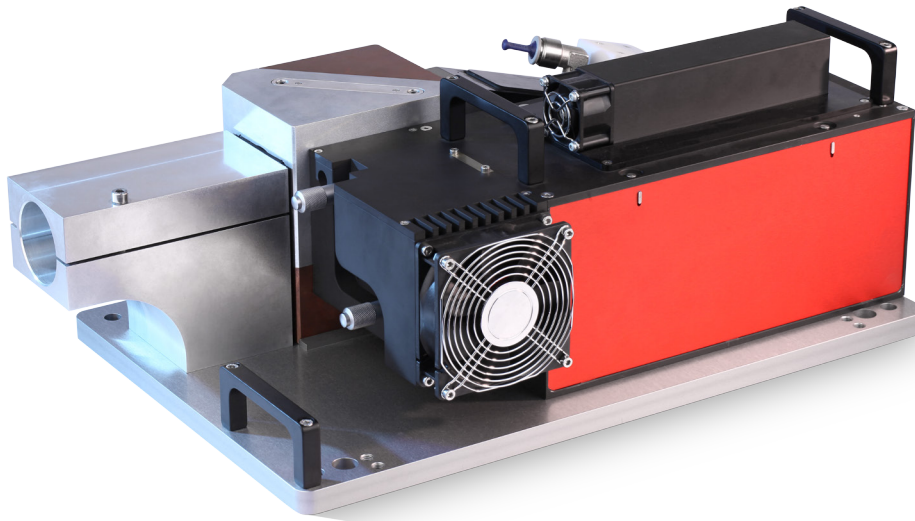


## LaserQualityMonitor LQM



The LaserQualityMonitor (LQM) characterizes the beam parameters of a beam source automatically and in a short period of time. The measuring system is compact, easily adjustable, and can be expanded individually.

### Determining Beam Propagations, Analyzing Errors

With the LaserQualityMonitor PRIMES offers an integrated solution for a fast and uncomplicated analysis of the beam characteristics of a beam source. With this measuring system the beam propagation of lasers of the UV- and NIR range is characterized and qualified. Moreover, errors with regard to the optical assembly of resonators and beam imaging systems can be analyzed easily.

This PRIMES innovation directly measures the power density distribution of a focus geometry generated by integrated focusing optics, which makes this system unique on the market. The advantage of this measurement method: Disturbances due to diffraction structures, misalignment, asymmetries and further effects become directly visible in the power density distributions measured.

### Compact, Easy, Individually Expandable

The LaserQualityMonitor characterizes the parameters of a beam source automatically, within a short period of time, and in conformity with the norm ISO 11146. It is a compact and easily adjustable measuring system which is positioned directly in front of the laser which is to be measured and is aligned with the laser beam. The LQM mainly consists of a base system in which all optical components and measuring functions are completely integrated. The base device can be supplemented by ancillary modules with a beam splitter, absorber, and alignment units. Moreover, the power level can be increased up to the multi kilowatt range. Fiber adapters, neutral density filter inserts as well as additional measuring objectives are available on request. Furthermore, integrated measuring stations can be provided as a special-purpose solution.

### In Practice

A typical field of application is quality assurance in the manufacturing of beam sources. The LaserQualityMonitor simplifies service and maintenance and supports both the laser and the system development.

### Measured Beam Parameters

- Beam waist diameter/focus radius
- Waist position/focus position in relation to the beam incidence into the LQM
- Beam dimensions
- Far-field divergence
- Rayleigh length
- Divergence
- Beam propagation factor K
- Beam quality factor

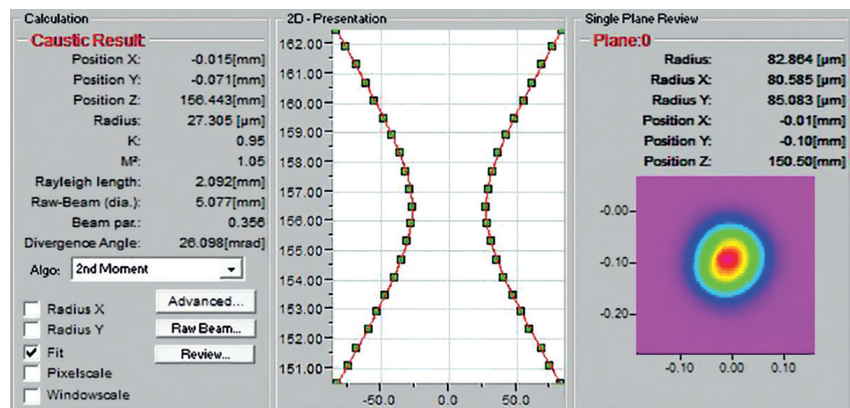
## LaserQualityMonitor LQM

### Measuring Procedure – the Principle

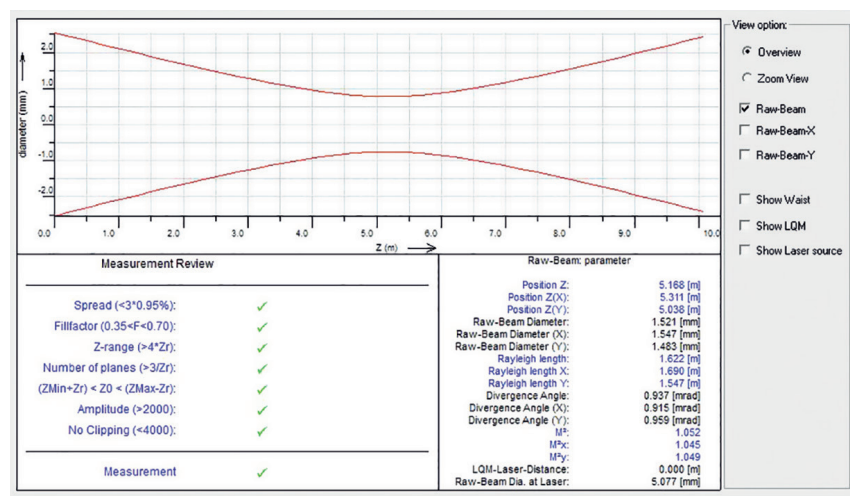
The characterization of a collimated laser beam with typical Rayleigh lengths of up to 10 meters requires a great measurement effort due to the long measurement paths of three to six Rayleigh lengths. For reasons of space, this form of measurement is normally impossible. Therefore, ISO 11146 alternatively recommends the measurement of a focus generated caustic in order to determine the beam quality factor  $M^2$ .

The LQM generates this caustic within the device by focusing the incoming collimated laser beam. The focused beam is magnified by several integrated attenuators as well as an objective and is then displayed on a CCD-chip. The resulting two-dimensional power density distribution allows the LaserDiagnosticsSoftware to determine radius, position and alignment of the beam. By moving this measurement setup and repeating the measurement in different positions within the device, all parameters necessary for the description of the artificial caustic are determined. The electronic irradiation time control of the CCD-chip expands the dynamic range of the system. Therefore, a modification of the filters during a measurement is generally not necessary.

By focusing and characterizing the laser beam, the measurement path is reduced from several meters to a few millimeters. In doing so, the  $M^2$ -value can be determined easily, as it is ensured that the optics used for focusing do not generate any aberrations which have an influence on the beam that is to be measured. According to ISO 11146 the values of the beam parameters of the focused laser beam are calculated back onto the values of the collimated laser beam.



Measurement of the artificial caustic with the HP-LQM



Calculation of the collimated beam of a single mode fiber laser

### Two Alternatives for the Operation

There are two alternatives for the operation of the LQM:

1. The PC-based LaserDiagnostics-Software (LDS) enables a manual or semi-automatic measurement of the beam distribution as well as a determination of the beam position and the beam dimensions.

2. Scripts control the LQM semi-automatically, e.g. for repetitive measuring tasks in service, quality assurance and acceptance. They are individually adapted to the current measuring procedure. Advantage: The programmed user guidance can reduce the demands on the operation of the LQM considerably.

# LaserQualityMonitor LQM

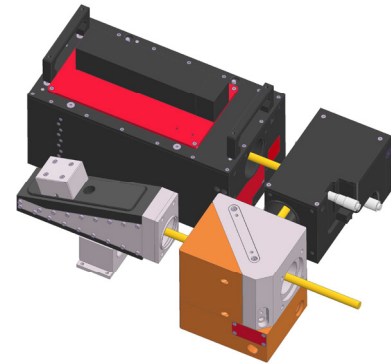
## Data Transmission

The data transmission to the PC is effected via Ethernet (100 MBit).

## Models and Options

- Power measurement at the absorber
- Clamp mounting for collimators with an outer diameter of 35, 40 and 50 mm

- Collimator with a focal length of 67 mm up to 6 kW and fiber connector LLK-D and QBH
- Measurement objectives 1:1 and 5:1
- Wavelength range: 1030 – 1090, 515 – 545 and 340 – 360 nm
- Neutral density filters OD1, OD2, OD3, OD4, OD5



Modular concept of the LQM

## Technical Data

	LQM 5	LQM 20	LQM 200	HP-LQM
Kenndaten Messung				
Leistungsbereich (gilt für 1064 nm)	5W	20W	200W (opt. 500W)	10kW
Pulsdauer	100fs - cw			
Wellenlängenbereich	1030 – 1090nm	340–360nm/515–545 nm/1030–1090nm		
Strhalabmessungen	1 – 15 mm			
Max.Strhaldivergenz	10mrad			
Versorgungsdaten				
Elektrische Versorgung	24V DC ± 5%, max. 1.8A			
Kühlung	Luftkühlung		Luftkühlung (opt. Wasserkühlung)	0.7 l/min/kW, partikelfrei
Kühlung (Leistungsmessoption)				> 7 l/min
Kommunikation				
Schittstelle	Ethernet			
Maße und Gewicht				
Bemessungen				
• Länge	285mm	285mm	350mm	480mm
• Breite	190mm	190mm	230mm	300mm
• Höhe	180mm	180mm	190mm	190mm
Gewicht	approx. 10kg	approx. 10kg	approx. 18kg	approx. 35kg
Umgebungsbedingen				
Gebrauchstemperaturbereich	+10 °C up to +40 °C			
Zulässige relative Luftfeuchtigkeit (nicht kondensierend)	10 – 80 %			