BeamMonitor BM-HQ

This reference system for raw beam diagnostics of CO_2 lasers has been used successfully for a number of years. In fact the BeamMonitor BM-HQ replaces the typical plexiglass burns used to identify the beam profile or beam symmetry.

The diagnostic device enables quick measurement with high precision. This is guaranteed by a detector with a high dynamic range. The BeamMonitor BM-HQ is the perfect device for analysing your laser beam. The mechanical scanning system measures the power density of collimated laser beams at full power. Due to its compact design and light weight, the BeamMonitor BM-HQ is ideal for integration into material processing systems and for use in servicing.

In the field

Since the geometric data, beam symmetry and power density distribution can all provide indications of the optical quality used, its absorption and dirt contamination level as well as alignment problems, regular checking is helpful. The cause of the change to the optics is the often unavoidable pollution of the surfaces of the optical components or inadequate cooling. Especially in the case of transmission components such as output coupling windows or beam splitters, the dirt contamination results in higher absorption and thus creates thermal lensing. This influences beam diameter and beam divergence. With the BM-HQ, the user is able to measure beam parameters quickly and reliably.

The principle

The laser beam is scanned point by point with a rotating measuring tip. The mirror mount is also moved in a linear fashion to scan the entire beam profile. In this way, a partial beam is diverted and directed at the detector in each instance.

The incoming signal is digitised and transmitted to the evaluation unit. The 14-bit A/D converter and resolution of up to 256 x 256 pixels employed enable an exact analysis even of small disturbances in the raw beam. The device was designed for use in harsh industrial manufacturing conditions, and is adaptable in every spatial orientation.

The software has the following functions:

1. Measurements: Single, serial measurements (monitor operation) and measurement of chronological development (linescan)
2. Displays: Isometry, false colours, contour lines and display of numerical results
3. Data saved in *.foc or ASCII file format

During the measurement, the entire beam exits the BeamMonitor and must be absorbed as completely as possible.

Feature: Pilot laser

The BM-HQ is equipped with a second detector for measuring the pilot laser (632 nm). This feature is used for alignment from the pilot laser to the processing beam.

Measured beam parameters

1. Beam position
2. Beam dimensions
3. Beam symmetry
4. Power density distribution

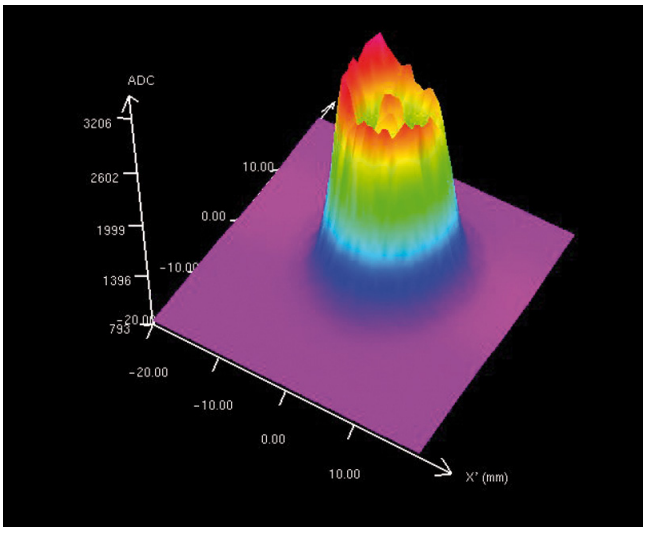
The device is operated from a PC. This enables the entire power density distribution to be represented within a few seconds. With an Ethernet connection, a maximum repeat frequency of 0.5 Hz is possible.
With the linescan function, the BM-HQ works at a repetition rate of around 30 Hz.

Operation

Various application-specific solutions are available for operating the BeamMonitor BM-HQ. There is a graphical operating interface in Microsoft Windows®. The data transfer between the measuring devices is based on the RS485 protocol; hence cable lengths of over 50 m are possible. For programming via PC, the signal is converted to RS232 via an interface converter. An Ethernet connection is available for the BM-HQ.

The following functions have also been implemented for special applications:

1. Checking of beam symmetry
2. Various colour scales for false colour representation
3. Alignment mode, which retains the results of the last 2 (3) measurements on the screen
4. Measurement results written directly to database via log function



Measurement of the power density distribution with the BM-HQ

Technical Data

	BM-HQ
MEASUREMENT PARAMETERS	
Power range	50 – 10 000 W
Wavelength range	10 600 nm
Beam diameter (depending on M^2)	5 – 35 mm
Max. power density	< 10 kW/cm²
Max. beam divergence	< 100 mrad
Irradiation time	2 s – infinity
A/D conversion	14 bit
Nominal measuring frequency	Linescan 30 Hz
DETERMINED PARAMETERS	
Beam position x, y	yes
Beam dimensions x, y	yes
Power density distribution	2D, 3D
Measurement duration per plane dependent on measured parameters (like resolution, rotation speed, position of measuring window)	5 – 40 s
DEVICE PARAMETERS	
Working range x-y	50 x 50 mm
Measurement window sizes	3.5 x 3.5 mm – 45 x 45 mm
Resolution	32 x 32 – 256 x 256 px
Rotation speed of the measuring tip	2 154 min^{-1}
Accuracy (beam diameter)	± 5 %
Reproducibility (beam diameter)	± 3 %
SUPPLY DATA	
Power supply	24 V DC ± 5 %, max. 0.7 A
COMMUNICATION	
Interfaces	Ethernet, RS485[1)]
DIMENSIONS AND WEIGHT	
Dimensions (L × W × H)	182 × 139 × 68 mm
Weight (approx.)	1.5 kg
ENVIRONMENTAL CONDITIONS	
Operating temperature range	15 – 40 °C
Storage temperature range	5 – 50 °C
Reference temperature	22 °C
Permissible relative humidity (non-condensing)	10 – 80 %

[1)] Only for communication with PowerMonitor.