

## MicroSpotMonitor-Compact MSM-C

Developed specifically for micro machining systems: The MicroSpotMonitor-Compact (MSM-C) extends the product range of camera-based focus analysis systems by a modularly configurable measuring system.

### Optimized for Micro-Machining Systems

The MicroSpotMonitor-Compact was specifically optimized for the limited installation space in micro-machining systems. The camera housing with electronics, attenuator, and power absorbers has dimensions of about 230×120×60 millimeters (L×W×H). The compact device does not have its own movement axes.

In connection with a laser processing system, however, caustic measurements, which are in conformity with current standards, can still be carried out easily.

By means of an optional PROFIBUS interface the device can be integrated into the system control. Thus, determined beam parameters are directly available for the machine control for further processing.

Due to the space saving design of the MicroSpotMonitor-Compact, a minimum beam entrance height of 150 millimeters is realized on a footprint the size of an A5 sheet of paper.

### In Practice

The MicroSpotMonitor-Compact is suitable for the control of beam parameters in laser systems for micro machining,

such as drilling of cooling channels in turbine blades, laser-sintering in SLM plants, the separation of wafers, spot-welding in medical technology, and many other manufacturing processes.

### Measured Beam Parameters

The power density distribution (of a single beam plane), the beam dimensions, and the orientation of the beam in the measuring plane are measured. Depending on the chosen spatial resolution, repetitive measurements can be carried out with a repetition rate of up to one Hertz.

In connection with an external z-axis:

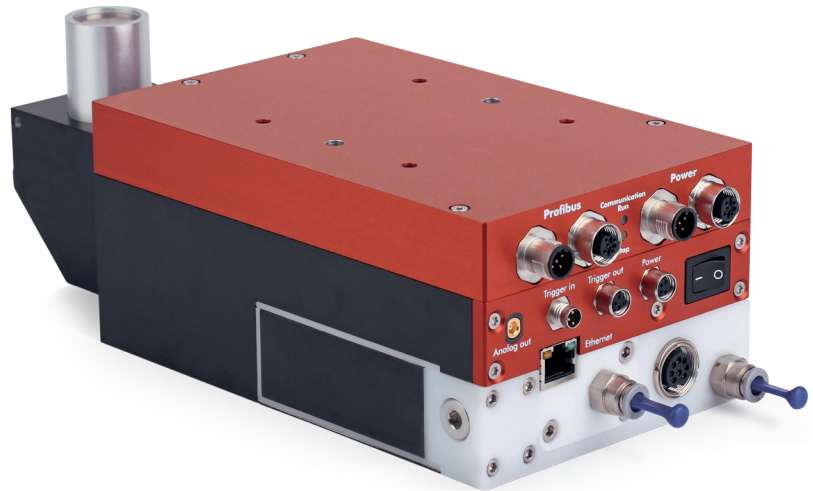
- Focus dimensions
- Focus position in space
- Beam quality factor  $M^2$  (beam propagation factor K, beam parameter product BPP)

- Rayleigh length
- Farfield divergence

### Measuring Procedure – the Principle

The laser beam, magnified by means of a measuring objective, is attenuated via two beam splitters and is finally imaged on a CCD sensor by a mirror. If required, an additional filter can be inserted in front of the sensor.

The beam geometry as well as the power density distribution are measured via the CCD sensor. The measuring data is transferred to a computer via Ethernet and is then evaluated using the PRIMES LaserDiagnosticsSoftware. As an option, the data can also be computed device-internally. They can then be transferred to the system control via a PROFIBUS interface.



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### Three Alternatives for Operation

There are three alternatives for the operation of the MicroSpotMonitor-Compact:

1. The computer-based LaserDiagnosticsSoftware (LDS) enables the manual or semi-automatic measurement of the beam distribution as well as the determination of the beam position and the beam dimensions.
2. Scripts can be used to control the MicroSpotMonitor-Compact semi-automatically, e.g. for repetitive measuring tasks in service, quality assurance and acceptance. They are individually adjusted to the current measuring procedure. Advantage: The programmed user guidance can reduce the demands on the operation of the MSM-C considerably.

3. The PROFIBUS-option enables a fully-automated measurement operation. Due to the connection with the machine control, measuring procedures can be directly controlled by means of machine programs.

### Data Transmission via Ethernet or PROFIBUS

By means of the PROFIBUS option, measuring results are transferred to the machine control. If required, the image of the last beam distribution measured can be recalled via Ethernet using the LDS.

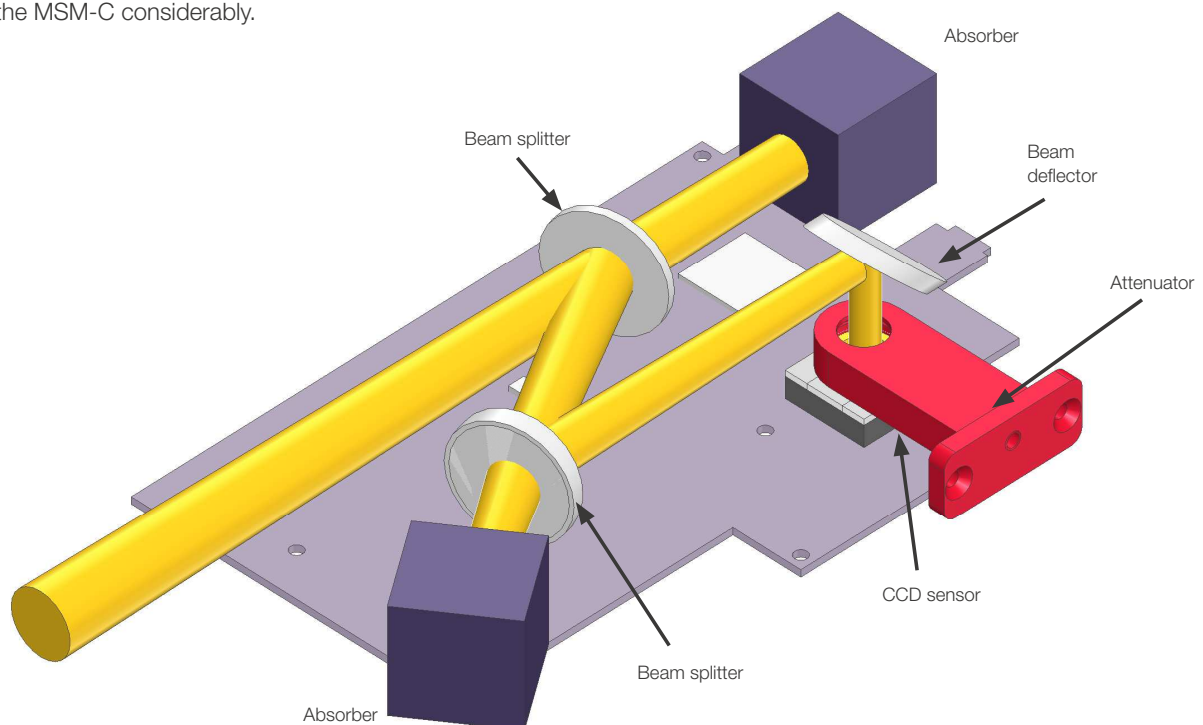
As an alternative, the image of the beam distribution and the measuring results can be provided in tabular form via an FTP server.

### Models and Options

- MicroSpotMonitor-Compact with magnification 3.3x (1064, 532 nm)
- MicroSpotMonitor-Compact incl. bending mirror for perpendicular beam incidence at low working height with magnification 5x (semiconductor industry)
- MicroSpotMonitor-Compact incl. overhead mounting for perpendicular beam incidence with minimum footprint with magnification 6.6x (SLM, SLS)

PROFIBUS options:

- Web server
- FTP server

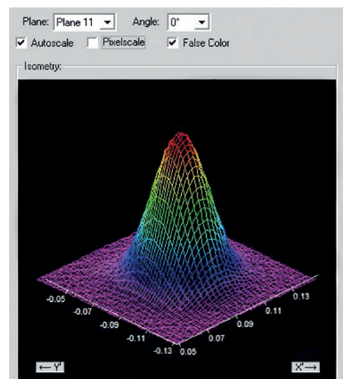


Schematic of the optical system inside the MSM-C

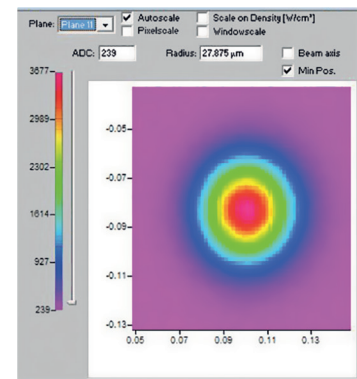
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### Accessories

- Attenuator for 1064, 532 nm: OD1, OD2, OD3, OD4, OD5
- Cyclones
- Protective window for measuring objective
- Overhead mount
- Beam bending
- Alignment aids for measuring objective and protective window mounting



3D presentation of the beam distribution



False color presentation of the measured beam distribution

### Technical Data

| Measurement Parameters                                                                                                |                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Power range                                                                                                           | 10mW – 1kW average power multi mode (up to 100W average power single mode)                            |
| Wavelength range                                                                                                      | 1030 – 1090nm (515 – 545nm, optionally up to 50 W)                                                    |
| Beam dimensions                                                                                                       | 10µm – 1 mm (depending on optics)                                                                     |
| Camera Module                                                                                                         |                                                                                                       |
| <ul style="list-style-type: none"> <li>• 3.3× (NA = 0.1)</li> <li>• Triggered measurement of pulsed lasers</li> </ul> |                                                                                                       |
| Supply Data                                                                                                           |                                                                                                       |
| Power supply                                                                                                          | 24V DC ± 5 %, max. 0.5 A                                                                              |
| Cooling water flow rate                                                                                               | 0.7 – 1.2l/min                                                                                        |
| Maximum water inlet pressure                                                                                          | 2 bar                                                                                                 |
| Recommended pre-filter with filter fineness                                                                           | 50µm                                                                                                  |
| Communication                                                                                                         |                                                                                                       |
| Interfaces                                                                                                            | Ethernet, PROFIBUS (optional)                                                                         |
| Dimensions and Weight                                                                                                 |                                                                                                       |
| Dimensions (L × W × H)<br>(without connectors)                                                                        | 231 × 120 × 60 mm (standard)<br>275 × 120 × 95 mm (with beam benders)<br>231 × 120 × 85 mm (PROFIBUS) |
| Weight                                                                                                                | approx. 2.6 kg (standard), approx. 3.1 kg (with beam benders),<br>approx. 3.1 kg (PROFIBUS)           |
| Environmental Conditions                                                                                              |                                                                                                       |
| Operating temperature range                                                                                           | +10 °C up to +40 °C                                                                                   |
| Permissible relative humidity (non-condensing)                                                                        | 10 – 80 %                                                                                             |