BeamControlSystem BCS

BeamControlSystem

The BeamControlSystem (BCS) enables the automated measurement of the most important laser beam parameters within industrial production lines. The laser beam power as well as the focus dimensions and the power density distribution are measured by the entirely dust-proof system.

Measuring Procedure – the Principle

This device combination unites the functionality of **two different PRIMES products** in one compact measuring system. Therefore, this device combination is ideal for the integration into a laser material processing system.

- **FocusMonitor**
- **CompactPowerMonitor**

Both systems communicate with a superordinate control, preferably by using the script control within the PRIMES LaserDiagnosticsSoftware. This enables the fully automated measurement of power and focus geometry initiated by the laser- or system control.

By means of the EVALUATION function the measuring data can be compared with defined limit values and corresponding warning signals are returned to the laser- or system control. All in all, this enables a completely automated monitoring of the beam parameters.

The device combination is completely dust-proof. The beam entrance is covered by a pneumatic shutter in standby mode. Hence, the measuring devices can work in a rough, industrial environment.

In Practice

In robot cells for laser beam welding, for example, this BCS is mounted in a re-ference point. Whenever the robot or Cartesian axes are referenced, the laser beam analysis can be started. The entrance aperture of the BCS is opened by the robot or master control and a measuring cycle is started.

If the EVALUATION function is used, i.e. if min.-max. values for focus radius, laser beam power etc. were defined, alarm signals can be initiated as soon as the tolerances are exceeded.

Moreover, manual evaluations allow the recording of measuring data and the generation of trends. In many cases the focus position, focus dimensions, the beam quality factor M^2, or the beam parameter product change "subtly", which could result in a slow but steady increase in the heat influence zone of a laser beam welding process.

The thermal distortion of the manufactured components would therefore also increase steadily – and maybe even unnoticed.

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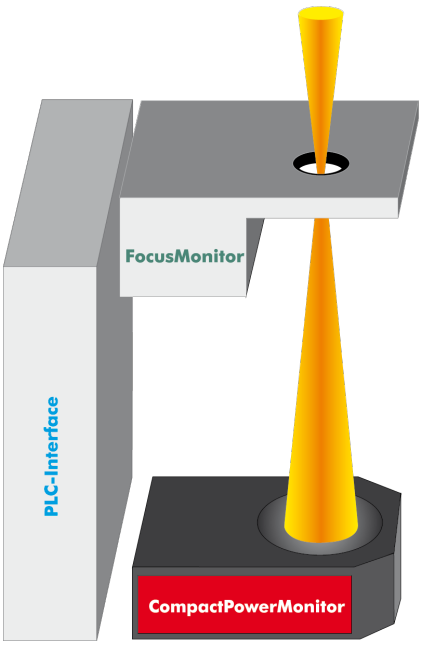
Measured Beam Parameters

In order to reach additional security with regard to quality assurance, the major laser beam parameters are monitored.

- Beam power, typ. ± 3 %
- Focus position z, up to typ. 10 % z_R
- Focus diameter, typ. ± 5 %
- Rayleigh length, typ. ± 5 %
- Beam parameter product, typ. ± 10 %
- M^2, typ. ± 10 %
- Ellipticity, typ. ± 10 %
- Astigmatism, typ. ± 10 %
- Beam direction z, typ. ± 0.2 °



Schematic setup of the BCS

**Interior view of the BeamControlSystem:
Top, FocusMonitor; bottom, CompactPowerMonitor**

Features of the BeamControlSystem

- Focus measurement from 0.2 mm to 3 mm
- PLC interface for the communication with laser- or system controls
- Script-controlled automated measuring procedures
- Monitoring of limit values for beam parameters
- Electro pneumatic shutter
- Control and measurement handling via PC
- Optional field bus interface for system integration

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Technical Data

Supply Data	
Cooling water flow rate	5–12 l/min
Cooling water pressure	6 bar
Compressed air	4 bar
Communication	
Interfaces (alternatively)	PROFIBUS RS 485, RS 232 Ethernet
Dimensions and Weight	
Dimensions (L × W × H)	400 × 245 × 355 mm
Weight	appox. 20 kg – 30 kg depending on configuration
Environmental Conditions	
Operating temperature range	+10°C up to +40°C
Permissible relative hunidity (non condensing)	10 – 80 %

Please see technical data for FocusMonitor and CompactPowerMonitor (pages 12, 32).

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PRIMES GmbH
Max-Planck-Straße 2
64319 Pfungstadt
Germany
info@primes.de
www.primes.de
Tel: +49 6157-9878-0
Fax: +49 6157-9878-128