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Cube

Power measurement in the smallest of spaces, mobile and wireless – these are the advantages of the new Cube.

Power in the Palm of Your Hand

The Cube is designed for power measurements of solid state lasers up to 12 kW. With its compact dimensions of only 60 x 65 x 65 mm it can be mounted into the tight spaces of machines for laser material processing without any problems. So the Cube enables the determination of laser power directly beneath the processing head in the processing zone.

Why Power Measurement in the Processing Zone?

A regular measurement of the laser power is one of the key parameters for the quality control of laser materials processing. The internal power display of beam sources can only show changes of the source itself. However, the whole beam path up to the processed part must be considered. Therefore, a power measurement as close as possible to the processing head, directly in or near the processing zone is recommended.

For conventional power measuring heads the accessibility of the processing zone is often difficult. In order to increase flexibility, PRIMES designed the Cube power meter.

Robust and Independent – Neither Cable nor Coolant Required

The specialty of the Cube: it works completely independently. No need for power supply cables or coolant supply.

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Operating power is provided via a Lithium cell, which can be charged via a micro-USB port. The integrated LCD shows important operation data, such as laser power, pulse duration or the current temperature of the absorber. The device is protected against shock and vibration as well as dust by a robust housing. All these advantages make it an ideal system for daily use.

Easy Operation with the Cube App

An integrated Bluetooth interface enables wireless communication between the power meter and a PC or mobile device. Therefore, the Cube is ideally suited for applications within enclosed working areas. Via the Cube App for mobile devices with Android™ the Cube can be controlled easily via a smartphone or tablet PC.

Aside from the graphic display and backup of the measured values stored in the Cube, it is possible to define presets for measurement series and transfer them to the Cube using the Bluetooth connection. The readings can be displayed graphically on the mobile device. In addition, a standard deviation evaluation of the measured values is possible with the PRIMES Cube App. The PRIMES Cube App is available in the Google Play Store as a free download.

Alternatively, the Cube can be connected via the micro-USB port to a stationary computer or Laptop. In combination with the PRIMES LaserDiagnosticsSoftware the control of the device, data analysis as well as storage is enabled.

The Principle

The absorber of the calorimetric measurement system is irradiated by a laser for a short period of time. The temperature difference of the absorber between start and finish of the laser pulse is measured. From the increase in temperature, the microprocessor based electronics is able to calculate laser power to a high degree of accuracy. This principle enables several successive measurements. The startup screen shows the current temperature of the absorber. An interlock signal is provided in order to turn off the laser beam emission, should the absorber overheat. The usage of this signal is strongly recommended.

Measurement Values – System Parameters

The Cube measures the incident laser energy and the irradiation time. The calculated laser power has an accuracy of ± 3 %, with a repeatability of ± 1 %.

System parameters for the laser:

- Wavelength: 900 – 1090 nm
- Power range: 25 – 12 000 W (average power)
- Measurement time = Pulse duration: 0.1 – 2 s

Laser power and irradiation time stand in direct relationship for the measurement.

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A Class of its Own – Cube M

Measuring very high power densities? No longer a problem: the new Cube M by PRIMES enables measurements up to a power density of 250 kW/cm² at a power of 2 kW!

This latest measuring device is designed to monitor laser power of high quality lasers even in the smallest of spaces that usually do not accommodate a measurement device. The original Cube is designed for power measurements of single shot measurements with solid state lasers.

In some high power cases, however, the intensity of the laser radiation is much too high for conventional power meters and will damage the coating of the absorber. For such applications, PRIMES developed the new Cube M, capable of high power density laser radiation measurements.

The specialty: The micro optics array at the beam entrance, which was developed in-house at PRIMES, enables a mounting of the Cube M directly in the focused laser beam underneath the processing optics. Also, the beam incidence does not have to be vertical; angles of incidence of up to ± 20° are possible. These features make the Cube M ideally suited for micro machining and additive manufacturing applications.

The specialist for high power densities: Cube M

Straight to the point: the Cube M measures close to the focal point of a laser

Measurement results at hand: Enabled by the Cube App

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Technical Data

	Cube	Cube M
Measurement Parameters		
Max. beam diameter on the absorber Aluminium absorber Copper absorber	 25 mm 30 mm	 – –
Max. beam diameter on the protective window	–	4 mm
Min. beam diameter on the protective window	–	1 mm
Wavelength range	900 – 1090 nm	1030 – 1090 nm
Power range • Aluminium absworber • Copper absorber	 25 – 8000 W [1] 25 – 12000 W [1]	 25 – 1000 W [1] 25 – 2000 W [1]
Irradiation time	0.1 – 2.0 s [1] (depending on laser power)	0.1 – 2.0 s [1] (depending on laser power)
Total duration until measurement value output	< 15 s	< 15 s
Nominal measurement frequency	300 J: 1 cycle/min; 3000 J: 1 cycle/15 min	300 J: 1 cycle/min; 3000 J: 1 cycle/15 min
Accuracy Angle of incidence up to 5 ° Angle of incidence from 10 ° to 20 °	 ± 3 % –	 ± 3 % ± 5 %
Reproducibility	± 1 %	± 1 %
Limit Values		
Max. absorber temperature	120 °C	120 °C
Energy per measurement	50 – 3000 J	50 – 3000 J
Recommended energy per measurement	300 – 500 J	300 – 500 J
Max. power density (peak) on the absorber (approx. 25 mm underneath the protective window) at beam diameters		
• Aluminium absorber > 10 mm 10 – 3 mm 3 – 1.5 mm < 1.5 mm < 1 mm	 1,5 kW/cm² 2,5 kW/cm² 5 kW/cm² 6 kW/cm² 8 kW/cm²	 – – – – –
• Copper absorber > 10 mm 10 – 3 mm 3 – 1.5 mm < 1.5 mm < 1 mm	 4 kW/cm² 5 kW/cm² 10 kW/cm² 12 kW/cm² 12 kW/cm²	 – – – – –
Max. power density (peak) at beam entrance	–	250 kW/cm²
Max. laser rise time	100 µs	100 µs
Max. angle of incidence perpendicular to inlet aperture	± 5 °	± 20 °
Max. centered tolerance	± 2.0 mm	± 2.0 mm
Supply Data		
Power supply	Lithium cell, which can be charged via a micro-USB port	
Communication		
Interfaces	USB/Bluetooth	
Dimensions and Weight		
Dimensions (L x W x H) (without connectors)	60 x 65 x 65 mm	60 x 65 x 80 mm
Weight (approx.)	400 g	600 g
Environmental Conditions		
Operating temperature range	15 – 40 °C	
Storage temperature range	5 – 50 °C	
Permissible relative humidity (non-condensing)	10 – 80 %	

[1] The stated limit values are to be understood in correlation with the permitted maximum energy (E = P · t).