Cube M

Power Measuring in the Smallest of Spaces

Narrow, hot, and contorted? Under even the most adverse conditions, our Cube M will show you exactly how your laser system is working in just one shot: so you'll never have to hear the ugly word "power loss" ever again. With its compact and small design, this little power pack can be used even in the tightest working areas and with the highest power densities. This makes the robust, cooling water free power meter perfect for all areas of additive manufacturing.

Rugged, mobile, and yet still extremely precise – that's what you're getting with the Cube M power meter. Internal power readouts from laser beam sources can only show changes at the source of the laser. The full path taken by the laser beam to reach the work piece is of utmost importance, which is why it makes sense to measure power as close to the working area as possible. We developed the Cube M especially for this type of use.

Its palm-sized design allows it to fit easily into the very tight spaces inside machines for use in laser material processing and it is designed to handle very high power densities. For some high-power applications, the irradiation is too intense for standard power meters and will destroy the coating on the absorber. The Cube M, however, can measure power densities of up to 250 kW/cm² with power of up to 2 kW!

Something Special

Thanks to the **micro optic at beam incidence** developed by PRIMES, the Cube M can be placed directly under the processing lens in the focused laser beam. Here it is not absolutely necessary for the laser beam to have a perpendicular incidence; deviations of ± 20° in relation to the vertical are acceptable.

These properties make the Cube M perfectly suited to use in micromachining and the revolutionary new industry of additive manufacturing.

The Principle

The absorber of the calorimetric measuring system is irradiated with the laser beam for a short time. Between the beginning and end of irradiation, the temperature of the absorber is recorded. Based on the temperature increase and the thermal properties of the absorber, the microprocessor-based electronic is capable of producing a high-precision calculation of the laser power.

Determining the temperature difference makes it possible to take multiple power measurements in succession. In the display start window, the current temperature of the absorber is shown. When the absorber overheats, an interlock signal will be activated that will stop the laser from emitting power. It is recommended that you use this signal.

The Key Benefits

1. The compact design of just 60 x 65 x 80 mm enable use of the Cube M in places within the system that might normally be out of the question

2. Do more than just record power changes at your laser source, be certain of the entire path of irradiation through to the workpiece

3. By systematically measuring performance at the working level over the entire working range, optical contaminants can be located quickly and effectively

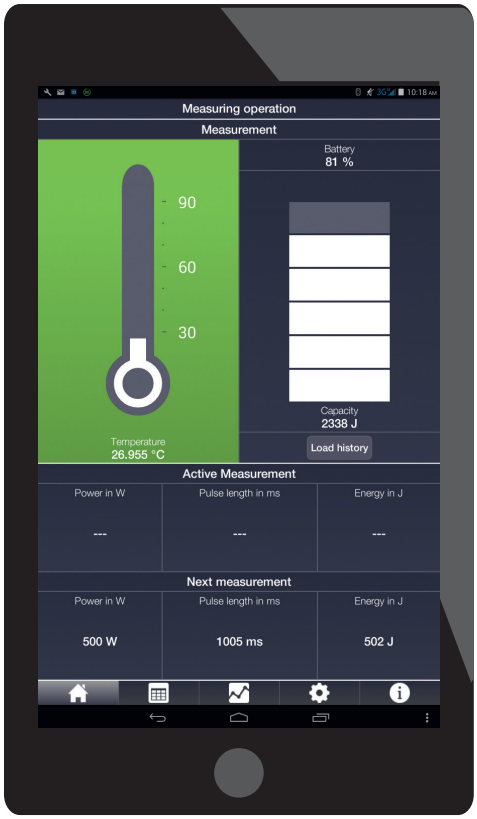
4. Specialized for high-performance applications with highest power densities of up to 250 kW/cm²

5. Wireless and without cooling water, dust and shock protection

Cube App – Mobile Measuring Using Your Smartphone

Using the PRIMES Cube app (bluetooth) for mobile devices with Android™, you can operate and monitor all Cube models simply and conveniently on a tablet or smartphone. Entire measuring series can be preset through the user-friendly interface on the mobile terminal and transmitted wirelessly to the Cube. It will graphically display the measuring values of laser power, pulse duration, and collected energy per pulse on the mobile terminal.

The Cube app also supplements this information with the standard deviations. You can download the PRIMES Cube app for free from the Google Play Store. A micro-USB interface can be used to connect with a stationary computer and thus use it in tandem with our new LaserDiagnosticsSoftware (LDS) to control the device, analyze and back up data.



Technical Data

	Cube M
MEASUREMENT PARAMETERS	
Power range	25 – 2 000 W [1]
Wavelength range	1 030 – 1 090 nm
Beam diameter on the protective window	1 - 4 mm
Max. power density on the protective window	250 kW/cm²
Irradiation time	0.1 – 2.0 s [1] (depending on laser power)
Min. on/off times (duty cycle) for pulsed lasers	50 µs (e.g. max. 10 kHz at 50% duty cycle)
Max. laser rise time	100 µs
Energy per measurement	50 – 3 000 J
Recommended energy per measurement	300 – 500 J
Total duration until measurement value output	< 15 s
Nominal measurement frequency	300 J: 1 cycle/min; 3 000 J: 1 cycle/15 min
DEVICE PARAMETERS	
Max. absorber temperature	120 °C
Max. angle of incidence perpendicular to inlet aperture	± 20 °
Max. centered tolerance	± 2.0 mm
Accuracy Angle of incidence up to 5 ° Angle of incidence from 10 ° to 20 °	 ± 3 % ± 5 %
Reproducibility	± 1 %
SUPPLY DATA	
Power supply	Integrated lithium-ion cell, which can be charged via a micro-USB port
Temperature range for charging the lithium-ion cell	0 – 45 °C
COMMUNICATION	
Interfaces	USB/Bluetooth
DIMENSIONS AND WEIGHT	
Dimensions (L x W x H) (without connectors)	60 x 65 x 80 mm
Weight (approx.)	800 g
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] The stated limit values are to be understood in correlation with the permitted maximum energy (E = P · t).