

Cube and Cube L



Fiber and disc laser



Diode laser



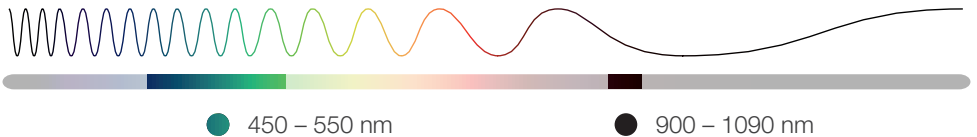
Ultrashort pulse laser



CO₂ laser



Cube



The Cube and Cube L are compact, reliable and highly accurate. Your power meter of choice for services even in confined spaces.



Caustic



Raw beam



Power



Beam profile



Pointing stability



Vector



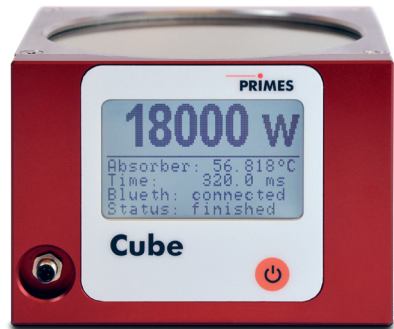
Focus shift

POWER RANGE	Cube 25 W – 12 kW Cube L 200 W – 20 kW
BEAM QUALITY M ²	Up to single mode
BEAM DIAMETER	Cube up to 30 mm Cube L up to 45 mm
SPECIAL FEATURE	Pulsed laser > 50 μs Internal storage
INTERFACES	Bluetooth, Micro-USB

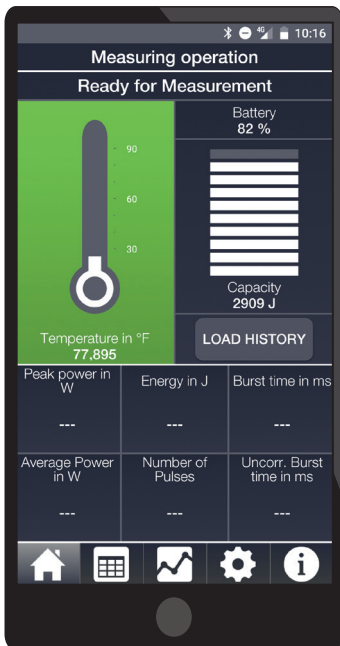
Tech Corner

Identical to the other Cube family members and related systems, the Cube and Cube L calculate the energy of a laser pulse by determining the temperature rise within their absorber. By measuring the length of the inserted laser pulse, the effective power is calculated. Due to this linear and accurate physical fact, this measurement method is particularly suitable for measuring laser power, even with the smallest amounts of energy.

The handling is designed to be as simple as possible, time-saving and with laser safety in mind. Place the Cube in a suitable distance to your laser and measure multiple power-levels. You don't need to cool the device with water or have to wait for minutes between measurements. You can also walk around your site and measure multiple lasers, one after the other. The laser cell can always be closed. An interlock constantly monitors the status of the measuring tool and unlocks in critical situations. Use the internal storage and the Cube App or our LaserDiagnosticsSoftware to evaluate your results later at your desk. You can also access the past measurements in the display with the easy one-button control.



Cube L



Using the PRIMES Cube App for mobile devices with Android™, you can operate and monitor all Cube models simply and conveniently on a tablet or smartphone via Bluetooth. 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.

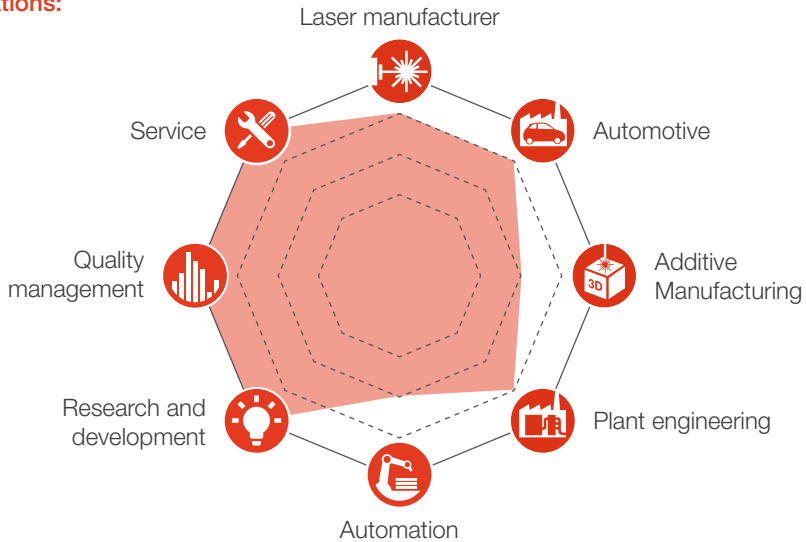
Alternatively, the micro-USB interface can be used to connect the Cube with a stationary computer and operate it with our new LaserDiagnosticsSoftware (LDS). This offers even more features to control the device or to analyze and back up measurement data.

MEASUREMENT PARAMETERS	CUBE	CUBE L
Power range	25 – 12 000 W ¹⁾	200 – 20 000 W ¹⁾
Wavelength range	450 – 550 nm, 900 – 1 090 nm	450 – 550 nm, 900 – 1 090 nm
Max. beam diameter on the absorber	30 mm	45 mm
Max. power density on the absorber at beam diameters	(ca. 30 mm underneath the protective window)	(ca. 29 mm underneath the protective window)
> 10 mm	4 kW/cm ²	4 kW/cm ²
10 – 3 mm	5 kW/cm ²	-
3 – 1.5 mm	10 kW/cm ²	-
< 1.5 mm	12 kW/cm ²	-
Irradiation time (depending on laser power)	0.1 – 2.0 s ¹⁾	0.1 – 2.0 s ¹⁾
Min. on/off times (duty cycle) for pulsed lasers (e.g. max. 10 kHz at 50 % duty cycle)	50 µs	50 µs
Max. laser rise time	100 µs	100 µs
Energy per measurement	50 – 3 000 J	depending on beam diameter ²⁾ : d > 35 mm: 200 - 5000 J 28 - 35 mm: 200 - 4000 J 20 - 28 mm: 200 - 3000 J d < 20 mm: 200 - 2000 J
Recommended energy per measurement	300 – 500 J	500 – 2 000 J
Total duration until measurement value output	< 15 s	< 15 s
Nominal measurement frequency	300 J: 1 cycle/min 3 000 J: 1 cycle /15 min	700 J: 1 cycle/min 5 000 J: 1 cycle/15 min
DEVICE PARAMETERS		
Max. absorber temperature	120 °C	120 °C
Max. angle of incidence perpendicular to inlet aperture	± 5 °	± 5 °
Max. centered tolerance	± 2.0 mm	± 5.0 mm
Accuracy at angle of incidence up to 5 °	± 3 %	± 3 %
Reproducibility	± 1 %	± 1 %
SUPPLY DATA		
Power supply	Built in lithium-ion battery, which can be charged via a micro-USB port	
Temperature range for charging the lithium-ion cell	0 – 45 °C	0 – 45 °C
COMMUNICATION		
Interfaces	USB/Bluetooth	USB/Bluetooth
Software	LaserDiagnosticsSoftware (LDS) and Cube App	
DIMENSIONS AND WEIGHT		
Dimensions (L x W x H) (without connectors)	60 x 65 x 65 mm	92 x 97 x 65 mm
Weight (approx.)	400 g	1 100 g

¹⁾The stated limit values are to be understood in correlation with the permitted maximum energy ($E = P \cdot t$).

²⁾Limiting the maximum energy as a function of the beam diameter serves to protect the device and prolongs its service life.

Applications:



System description: The Cube and Cube L are compact power meters, using the proven calorimetric measuring principle. Its high accuracy of $\pm 3\%$ is realised by additional thermal sensors within the housing. **Decoupled of the environment, Cube and Cube L work with high precision in the range of several watts up to multi kilowatts in just one device.** Measure your CW- or pulsed laser system in the wavelength range of NIR and VIS. Thereby, PRIMES Cube will capture every single pulse, up to a frequency of 10 kHz and 50 % duty cycle.

Your benefit: Due to their compact design and high accuracy, the Cube and Cube L are reliable tools that fit in every service box. Once the Cubes are charged, they can be operated with a mobile device for Android™ via Bluetooth using the PRIMES Cube App – **no wiring needed.** The display of the Cube shows all the information you need at a glance, but can provide even more parameters by pressing just one button. For a better comparison of individual measurements, an internal storage allows a series of measurements which can be displayed after all your measurements are done.

CONCLUSION

Qualification and service have never been that easy. PRIMES Cube masters all the challenges from the laser market with its high diversity. No matter what power level or application, the PRIMES Cube is your solution.



For further information please visit www.primes.de/cube

Cube M



Fiber and disc laser



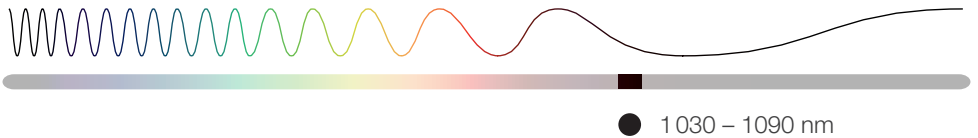
Diode laser



Ultrashort pulse laser



CO₂ laser



Measure laser power with densities of up to 250 kW/cm² in confined spaces, even in the corners of your Additive Manufacturing machine.



Caustic



Raw beam



Power



Beam profile



Pointing stability



Vector



Focus shift

POWER RANGE	25 W – 2 kW
BEAM QUALITY M ²	Up to single mode
BEAM DIAMETER	Focused 1 – 4 mm
SPECIAL FEATURE	Angle of incidence ±20° Power densities 250 kW/cm ²
INTERFACES	Bluetooth, Micro-USB

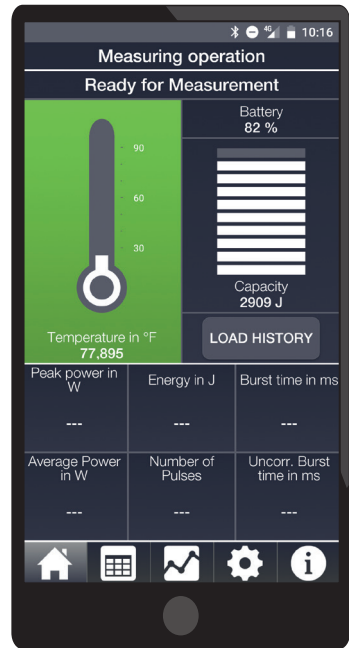
Tech Corner

Identical to the other family members and related systems, the Cube M calculates the energy of a laser pulse by determining the temperature rise within its absorber. By measuring the length of the inserted laser pulse, the effective power is calculated. Due to this linear and accurate physical fact, this measurement method is particularly suitable for measuring laser power, even with the smallest amounts of energy.

What makes the Cube M unique is the optical front end, which does not only allow power densities of up to 250 kW/cm^2 , but also angles of incidence of up to 20° . This enables measuring laser power in scanner based processes on the entire working area.

Using the PRIMES Cube App for mobile devices with Android™, you can operate and monitor all Cube models simply and conveniently on a tablet or smartphone via Bluetooth. Entire measuring series can be recorded during the measurement or uploaded from the internal storage (14 measurements) of the Cube. It will graphically display the measured values, such as average-, or peak power, energy per pulse and pulse duration.

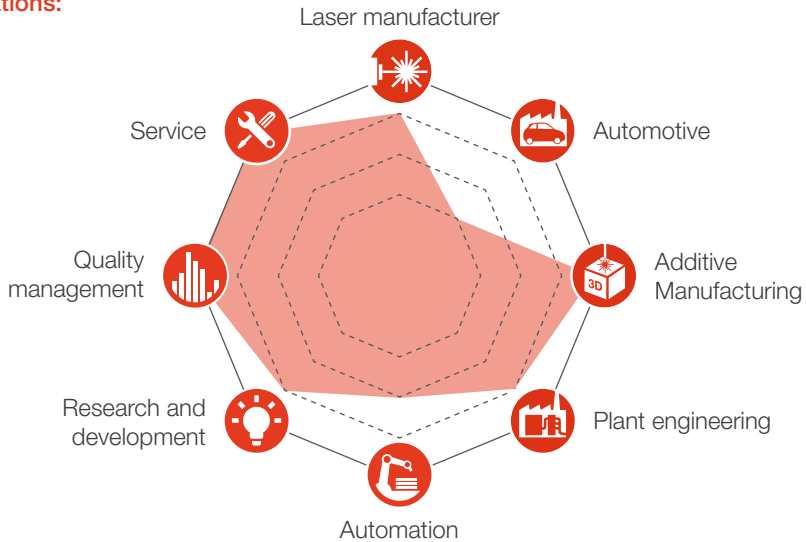
The Cube App also supplements this information with the standard deviations. You can download the PRIMES Cube App for free from the Google Play Store. Alternatively, the micro-USB interface can be used to connect the Cube with a stationary computer and operate it with our new Laser-DiagnosticsSoftware (LDS). This offers even more features to control the device or to analyze and back up measurement data.



MEASUREMENT PARAMETERS		CUBE M
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/cm ²	
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 °	± 3 %	
Angle of incidence from 10 ° to 20 °	± 5 %	
Reproducibility	± 1 %	
SUPPLY DATA		
Power supply	Built in lithium-ion battery, which can be charged via a micro-USB port	
Temperature range for charging the lithium-ion cell	0 – 45 °C	
COMMUNICATION		
Interfaces	USB/Bluetooth	
Software	LaserDiagnosticsSoftware (LDS) and Cube App	
DIMENSIONS AND WEIGHT		
Dimensions (L x W x H) (without connectors)	60 x 65 x 80 mm	
Weight (approx.)	800 g	

¹⁾The stated limit values are to be understood in correlation with the permitted maximum energy ($E = P \cdot t$).

Applications:



System description: The Cube M is an advanced version of the established Cube, designed to meet the demands of high power densities in confined spaces. Remote applications up to 2 kW and measurements even in the corners of your Additive Manufacturing machine are its strengths. **The unique optical front end allows measuring power densities of up to 250 kW/cm² with an angle of incidence of $\pm 20^\circ$.** This highly sophisticated optical front end is taken into account during calibration and does therefore deliver the highest accuracy.

Your benefit: The Cube M is capable of measuring multiple lasers of an Additive Manufacturing machine without cooling or interfering cables on the entire build platform. **When placed in the overlap of multiple lasers, the Cube M measures the power of all processing lasers without having to open the processing chamber door in the meantime.** Testing 4 lasers, for example, is done in less than 4 minutes, making it possible to perform a power check between each build.

CONCLUSION

The Cube M is a compact, robust and reliable solution for measuring high power densities of up to 250 kW/cm² in your remote application. Due to fast and easy measurements without cooling or cables it's the perfect tool for your quality assurance between each build job.



For further information please visit www.primes.de/cubeM