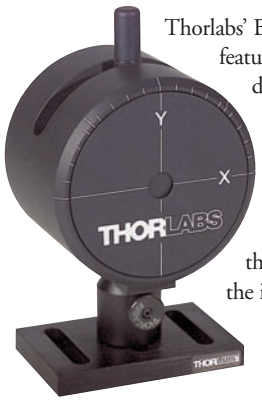
For current pricing, please see our website.

Beam Profilers (Page 1 of 4)

For Software Details, See Page 1616



BP100 SERIES
(Base and Post Not Included)

Thorlabs' BP100 Beam Profiler Series is a full-featured, high-precision instrument with a dynamic range of 72 dB that can analyze the power distribution of laser beams with diameters from 10 µm to 9 mm. It is available with a Si, Ge, or extended InGaAs sensor. The measurement head has a USB 2.0 interface, which allows the user to easily operate the device with the included software.

Functionality

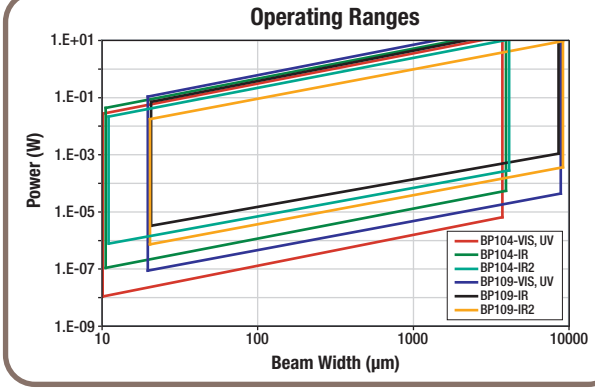
Two narrow slits are used to scan the beam in two defined orthogonal directions. To determine the beam's quality and spatial characteristics, the passing light is integrated by the detector and sampled. This method allows a wide range of power and beam diameters to be analyzed without the need for attenuators or lenses. From the resulting power distributions for the X and Y directions, all analyzed beam parameters are calculated such as diameter, ellipticity, peak location, centroid, gaussian fit, and beam power. The direction of X and Y is set manually by a rotation mount that allows for rotating the complete measuring system in the housing by ±60°.

A variable average function provides adjustable noise reduction and increases the measurement accuracy. The max-hold function allows analysis of pulsed laser sources, and the automatic or manual gain control enables the user to adapt to different beam powers. The BP100 Series can display the measured power in mW or dBm, and the device can be calibrated with an external power meter. These beam profilers ship with our versatile software and driver package (see page 1616 for details).

Features

- Four Wavelength Ranges Available: UV, VIS, NIR, and IR
- High-Precision Analysis of Beam Quality and Spatial Power Distribution
- Integrated Power Measurement
- Continuous and Pulsed Sources >10 Hz Repetition Rate*
- Variable Scanning Speed: 1 to 20 Hz
- High Dynamic Range: 72 dB
- Automatic and Manual Gain Control (Switchable)
- Power Range 10 nW - 10 W
- Average and Max-Hold Functions

* For M^2 measurements a pulse rate ≥300 kHz is required



ITEM #	BP104-UV	BP104-VIS	BP104-IR	BP104-IR2	BP109-UV	BP109-VIS	BP109-IR	BP109-IR2
Wavelength Range	200 - 1100 nm	400 - 1100 nm	700 - 1800 nm	1000 - 2700 nm	200 - 1100 nm	400 - 1100 nm	700 - 1800 nm	1000 - 2700 nm
Detector Type	Si[a]	Si	Ge	Extended InGaAs	Si[a]	Si	Ge	Extended InGaAs
Aperture Diameter	4 mm				9 mm			
Slit Size	2.5 µm				5 µm			
Beam Diameter (Min)	10 µm				20 µm			
Beam Diameter (Max)	4 mm				9 mm			
Scan Rate	1.0-20.0 Hz (Continuously Variable)							
Sampling Resolution	0.5 - 38 µm (Depending on Scan Rate)				1.1 - 38 µm (Depending on Scan Rate)			
Power Range[b]	10 nW to 10 W (Depending on Beam Diameter)							
Amplifier Bandwidth	10 kHz and 20 - 150 kHz (-1 dB)							
Sample Frequency	0.0625 - 1.0 MHz							
Dynamic Range	72 dB (Amplifier Switchable)							
Signal Digitization	16 Bit							
Head Size	Ø80 mm x 60 mm (Ø3.15" x 2.36")							
Mounting	M4 x 0.7, M6 x 1.0, and 8-32							

[a] Si-UV Enhanced [b] Power levels between 1 and 10 W should only be used with short exposure times (<30 seconds)

ITEM #	$	£	€	RMB	DESCRIPTION
BP104-UV	$ 3,840.00	£ 2,764.80	€ 3.340,80	¥ 30,604.80	Slit Scanning Beam Profiler, 200 - 1100 nm, Ø4 mm Aperture
BP104-VIS	$ 3,600.00	£ 2,592.00	€ 3.132,00	¥ 28,692.00	Slit Scanning Beam Profiler, 400 - 1100 nm, Ø4 mm Aperture
BP104-IR	$ 4,140.00	£ 2,980.80	€ 3.601,80	¥ 32,995.80	Slit Scanning Beam Profiler, 700 - 1800 nm, Ø4 mm Aperture
BP104-IR2	$ 5,100.00	£ 3,672.00	€ 4.437,00	¥ 40,647.00	Slit Scanning Beam Profiler, 1000 - 2700 nm, Ø4 mm Aperture
BP109-UV	$ 4,200.00	£ 3,024.00	€ 3.654,00	¥ 33,474.00	Slit Scanning Beam Profiler, 200 - 1100 nm, Ø9 mm Aperture
BP109-VIS	$ 3,960.00	£ 2,851.20	€ 3.445,20	¥ 31,561.20	Slit Scanning Beam Profiler, 400 - 1100 nm, Ø9 mm Aperture
BP109-IR	$ 4,500.00	£ 3,240.00	€ 3.915,00	¥ 35,865.00	Slit Scanning Beam Profiler, 700 - 1800 nm, Ø9 mm Aperture
BP109-IR2	$ 5,600.00	£ 4,032.00	€ 4.872,00	¥ 44,632.00	Slit Scanning Beam Profiler, 1000 - 2700 nm, Ø9 mm Aperture

Beam Profilers (Page 2 of 4)

BC106-VIS

SM1BC

For Software Details, See Page 1616

Features

- High Resolution: 1360 x 1024 Pixel
- >62 dB Signal to Noise Ratio
- Windowless Sensor Area for Best Uniformity and Linearity
- Full 2D Analysis of Complex Beam Profiles
- User Calibratable Power Readout
- Exposure Time from 20 µs to 1 s (Automatic and Manual)
- Gain Control from 1X to 16X (Automatic and Manual)
- Four ND Filters on the Included Filter Wheel
- Power Range: 50 fW - 1 W
- Black Level and Smart Ambient Light Correction
- For CW or Pulsed Laser Beams and Single Pulse Analysis
- External Shutter Trigger Input

The BC106 Series is our line of camera-based beam profilers. CCD profilers show more details than scanning split profilers and offer true 2D analysis of the beam's power density distribution. This allows complex mode patterns (like flat top and donut) to be identified while optimizing a laser system. These CCD-based beam profilers can also be used to measure power and are perfectly suited for simultaneous power and beam shape optimization without needing an external power meter. Use them to measure continuous wave (CW) or pulsed beams of any frequency. Several trigger modes allow flexible capturing of single pulses. A TTL input is provided for triggered single pulse detection up to a repetition rate of 50 kHz. The beam profilers ship with our versatile software (see page 1616 for details).

High-Quality CCD Camera

Compared to CMOS-based beam profilers, the CCD cameras in these beam profilers offer the following advantages:

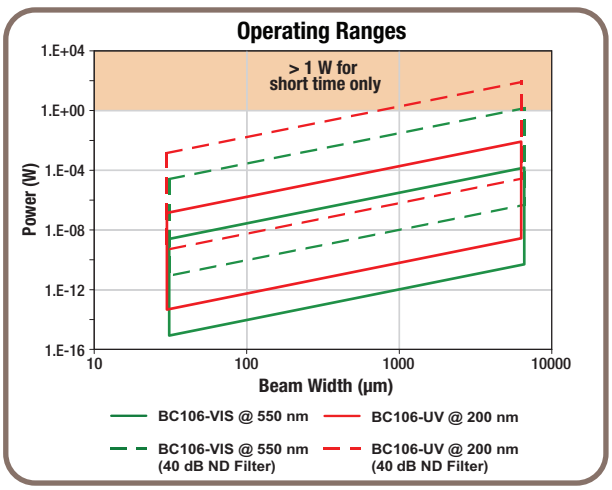
- Excellent Sensitivity and Low Noise
- Enhanced Global Shutter Efficiency for Improved Exposure Accuracy and Uniformity
- Automatic Dark Level Calibration

Frame Rates

The Hi-Speed USB 2.0 interface allows up to 10 frames per second at full resolution. Measurements at higher frame rates can be achieved with reduced frame sizes (e.g., for a selected ROI).

Filter Wheel

An integrated filter wheel with four different high-quality ND filters allows the profiler to be easily adapted to beam intensities from femtowatts to 1 W without extra accessories. With the SM1BC adapter SM1-threaded (1.035"-40) components can be easily mounted.



ITEM #	BC106-UV	BC106-VIS
Wavelength Range	190 - 350 nm[a]	350 - 1100 nm
Power Range	50 fW - 1 W[b]	1 fW - 1 W[c]
Attenuation Filters[f] (Nominal Values, on Filter Wheel)	20, 40 dB VIS 20, 40 dB UV	10, 20, 30, 40 dB VIS
Beam Diameter	30 µm - 6.6 mm	
Compatible Light Sources	CW, Pulsed	
Pulse Frequency	1 Hz - 50 kHz (Single Pulse Exposure) Unlimited (Multi Pulse Exposure)	
Sensor		
Coating	Lumigen	No Coating
Chip Type	2/3" EXview HAD™ CCD Sensor Sony ICX285AL, Window Removed	
Aperture Size (Max)	8.77 mm x 6.6 mm	
Pixel Size	6.45 µm Square	
Resolution (Max)	1360 x 1024 pixels, ROI[e] Selectable	
Camera		
Shutter	Global	
Frame Rate[d]	10 fps Full Resolution, >27 fps @ 640 x 480, >43 fps @ 320 x 240	
Image Digitization	8 Bit (0 - 255 Digits) or 12 Bit (0 - 4095 Digits)	
Signal-to-Noise Ratio	≥62 dB	
Exposure Range	20 µs - 1 s	
Gain Range	1x - 16x	
Image Capture Modes	Single Frame, Continuous, Hardware Triggered	
Interfaces		
Trigger Input	TTL Level, BNC Jack	
Trigger Delay	42 µs - 1 s, Programmable	
PC Interface	USB 2.0	

[a] Wavelength range of included removable UV ND filters starts at 220 nm
[b] @ 200 nm, depending on beam diameter and ND filter
[c] @ 550 nm, depending on beam diameter and ND filter
[d] Depending on the performance of the computer system
[e] Region of interest
[f] VIS filter is absorptive, UV filters are reflective

ITEM #	$	£	€	RMB	DESCRIPTION
BC106-UV	$ 4,230.00	£ 3,045.60	€ 3.680,10	¥ 33,713.10	CCD Beam Profiler, 30 µm - 6.6 mm, 190 - 350 nm
BC106-VIS	$ 3,975.00	£ 2,862.00	€ 3.458,30	¥ 31,680.75	CCD Beam Profiler, 30 µm - 6.6 mm , 350 - 1100 nm
SM1BC	$ 38.00	£ 27.36	€ 33,06	¥ 302.86	SM1 Adapter for BC106 Series CCD Camera Beam Profiler

For current pricing, please see our website.

Beam Profilers (Page 3 of 4)

Thorlabs offers two types of beam profiler systems. The first is a dual scanning slit-based system. It is easy to align and features fast simultaneous measurements of both the X and Y profiles with a large dynamic range of 72 dB. The alternative utilizes a CCD camera to analyze the beam's profile and offers more details and true 2D analysis of the beam's power density distribution when compared to scanning slit profilers. This allows complex mode patterns (like flat top and donut) to be identified while optimizing laser systems. Our series of extension sets allows automated, motorized, computer-controlled M^2 analysis. M^2 analysis kits using slit beam profilers are available pre-assembled with all the needed components included. Below is a table summarizing the features of both slit and CCD camera based beam profilers.

SPECIFICATION	SCANNING SLIT BASED		CCD CAMERA BASED
Series	BP104	BP109	BC106
Wavelength Ranges Available	200 - 1100 nm 400 - 1100 nm 700 - 1800 nm 1000 - 2700 nm	200 - 1100 nm 400 - 1100 nm 700 - 1800 nm 1000 - 2700 nm	190 - 350 nm 350 - 1100 nm
Power Range[a]	10 nW - 10 W		50 fW - 1 W
Aperture Size	Ø4 mm	Ø9 mm	8.77 mm x 6.6 mm
Beam Diameter	10 µm - 4 mm	20 µm - 9 mm	30 µm - 6.6 mm
Resolution	N/A		1.3 megapixels[b]
ND Filters	–	–	√
Compatible Extension Sets	50 mm, 150 mm, 300 mm		150 mm, 300 mm

a) Powers over 1 W are for short exposure times (<30 s) only.

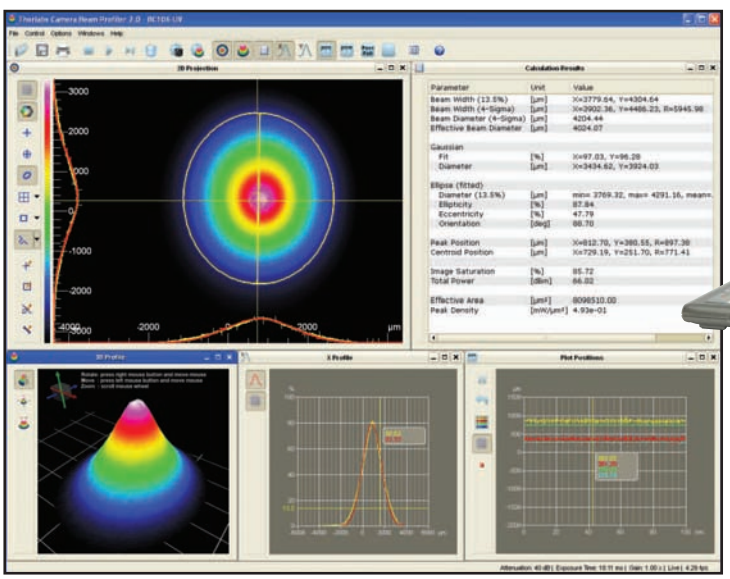
b) Pixel calculation is dependent upon ROI selected. Resolution of the BC106 Series is 1360 x 1024 pixels.

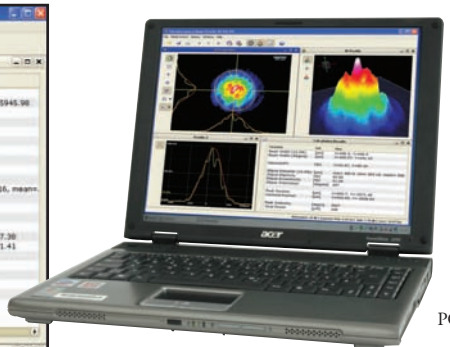
Beam Profiler Software

Our versatile beam profiler software and driver package ships with both the BP100 Scanning Slit Beam Profiler Series and with the BC100 CCD Camera Beam Profiler Series. Its Graphical User Interface (GUI) allows individual views of the X and Y beam cross sections, 2D projections, and 3D profiles in gray scale or color mode as well as the numerical parameters in separate windows. Many details like peak and centroid position, Gaussian approximations of the X and Y profiles, and elliptical fits of the beam's cross section can be superimposed, faded out, or displayed in many different variations. The beam diameter is calculated according to the ISO 11146 standard (i.e., 4σ) or at any user-defined clip level. GUI images and calculated data can be saved to different file formats.

Software Features

- Versatile Graphical Interface with Easy-to-Adjust Windows
- Cross-Sectional X and Y Profiles at Adjustable Locations with Gaussian Fit
- Averaging Capabilities
- 2D Power Density Diagram with Elliptical Beam Fit, Flexible 3D Graph
- Location and Power Measurement Over Time
- Beam Stability Plot
- M^2 and Divergence Measurement
- Pass/Fail Test
- Units µm/pix and mW/dBm
- Changeable Color Schemes in Linear, Logarithmic, and Quadratic Scaling
- C++ and LabVIEW™ Sample
- Data Output via NI-Network Variables
- Image and Text File Output
- USB 2.0 Interface





PC Not Included

Figure 1: Main GUI
The GUI consists of a toolbar and specific windows for the different analysis options. These windows can be individually arranged, resized, closed, and opened to easily adjust to specific tasks.

Beam Profilers (Page 4 of 4)

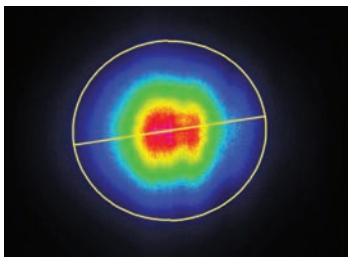


Figure 2

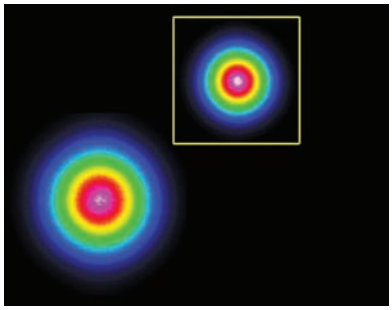


Figure 3

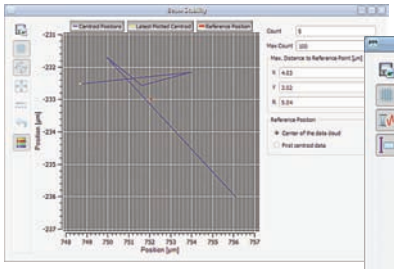


Figure 4

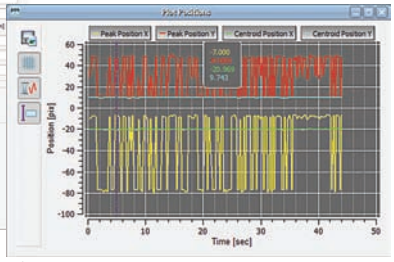


Figure 5

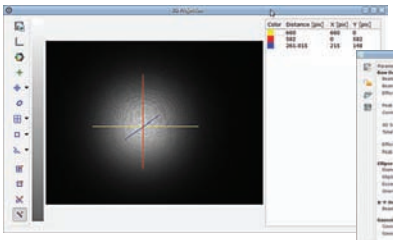


Figure 6

Figure 7

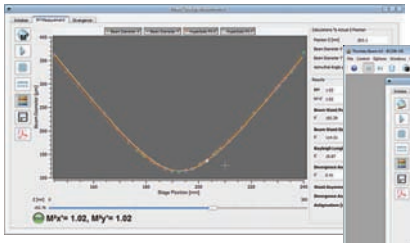


Figure 8

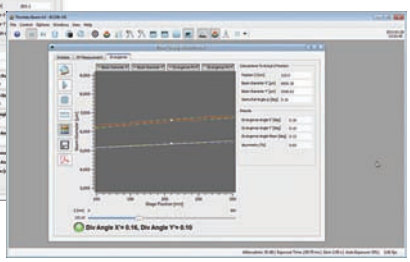


Figure 9

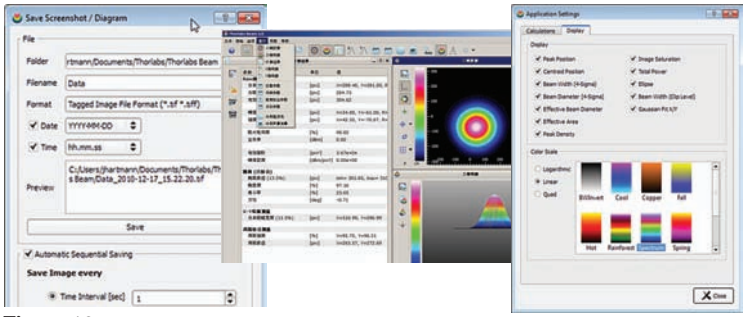


Figure 10

Figure 2: Beam Fit by Elliptical Approximation
An ideal ellipse is fitted to the measured asymmetric beam profile. The max, min, and mean beam diameters as well as the ellipticity and major axis angle for the ellipse are given.

Note: this feature is only available with the CCD beam profilers.

Figure 3: Analyzing Beam Fragment
Within a preselected region of interest (ROI) a rectangular beam section (Calculation Area) can be marked for fragment analysis. Detailed analysis of the position, beam diameter, and power distribution for the selected beam fragment is provided.

Note: this feature is only available with the CCD beam profilers.

Figure 4: Beam Stability
This screen shows the path of the centroid position drift in x and y coordinates to visualize beam pointing instabilities of a laser source. The plots will automatically resize to the drift dimensions.

Figure 5: Measurement Over Time
The software analyzes the drift of the centroid X and Y coordinates over time to visualize time-dependent drift patterns of a laser source. An ideal source shows horizontal lines for the X and Y coordinate. Additionally, "Power", "Gaussian Fit", and "Ellipse Orientation" can be plotted as a function of time.

Figure 6: Distance Measurements
In the 2D power distribution image, distances can be measured by drawing a line between two points of interest.

Figure 7: Pass/Fail Analysis
A selected set of calculation results is evaluated according to user-defined minimum and maximum limits. This pass/fail analysis is especially useful for high-volume production tests.

Figure 8: M^2 Measurements
The beam diameter and location of the beam waist are shown after an M^2 analysis has been performed.

Note: This functionality can only be used when the extension set is connected to the PC.

Figure 9: Divergence Measurements
The divergence of the beam is shown after a divergence analysis has been performed.

Note: This functionality can only be used when the extension set is connected to the PC.

Figure 10: Options
The software package allows the user to customize features such as languages (Choose from English, German, Chinese) and the color scheme of beam profile. The software can also automatically save sequential files.