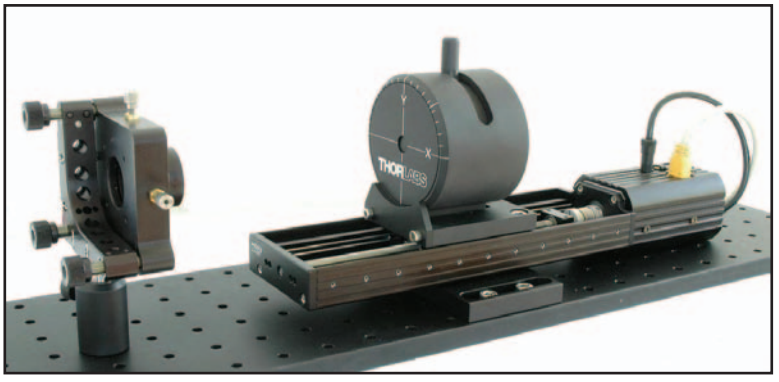
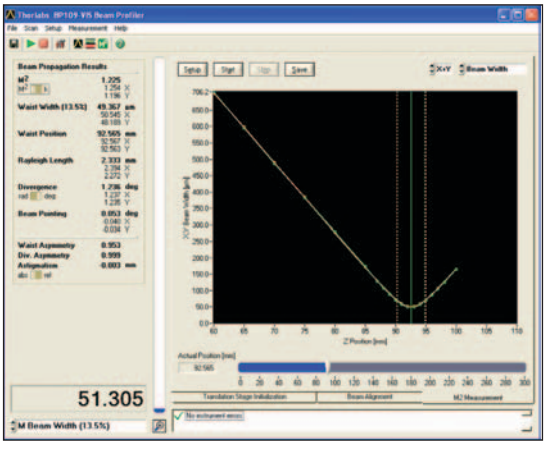
# M² Beam Profiler Analyzer Extension Set

The BP1M2 Series is an easy-to-use analysis extension set to be used with Thorlabs' BP100 Series Beam Profiler for automated $M^2$ beam quality analysis. The BP1M2 Series allows measurement of the times-diffraction-limit factor $M^2$ of a laser beam and its reciprocal beam quality, $k=1/M^2$, as well as other beam parameters for divergent and nearly parallel beams within a short time.

The system is comprised of a motorized translation stage and mounting accessories that can be used with the BP100 Beam Profiler. The stage movement is fully controlled by the software module of the BP100, which allows it to take measurements at different stage positions and perform a complete $M^2$ analysis. This is done by taking multiple measurements of the beam diameter of the collimated beam at different positions along the beam propagation axis.



BP109-VIS Beam Profiler mounted onto a BP1M2-150 Extension Set
(on a breadboard with focusing lens – breadboard and lens ordered separately)




### Beam Quality

High beam intensities or high-quality, highly focused beams are required for certain applications. A beam profile may show a Gaussian shape, but the beam quality may still be quite low due to the presence of undetected higher-order modes. The parameter $M^2$ or its reciprocal k value is the standard measure for the beam quality, which shows how close the beam quality is to the diffraction limit of a perfect Gaussian beam (pure mode TEM00). An accurate determination of $M^2$ cannot be obtained by a single beam profile; it requires multiple profile measurements at different points along the beam path.

### Divergent Beams

A hyperbolic curve fit to the measured data yields reliable and repeatable values for beam waist diameter and position, Rayleigh range, divergence angle, beam pointing direction, waist asymmetry, divergence asymmetry, and astigmatism.

### Nearly Parallel Beams

The divergence angle of nearly parallel beams can also be accurately determined by a linear curve fit. Both methods – the hyperbolic curve fit of a focused beam and the linear fit without focusing lens – can be combined, at which point all beam parameters of the unfocused beam are approximated. The combined fitting method allows for the characterization of unfocused beams, even if the waist location and Rayleigh length are far away from the scanning range of the translation stage.

## Specifications

- **Translation Stage:** Stepper Driven Lead Screw
- **Controller Interface:** RS-232, Convertible to USB
- **Translation Range:** 50mm/150mm/300mm
- **Optical Axis Height:** 90mm
- **Wavelength Range:** 200-1800nm
- **$M^2$ Measurement Range:** 1.0 - No Upper Limit
- **Typical $M^2$ and k Accuracy:** ±5%, Depending on Optics and Alignment
- **Accepted Beam Diameter for 5% Accuracy:** 20µm - 2mm (BP104), 20µm - 4.5mm (BP109)
- **Continuous and Pulsed Sources:** ≥10Hz*
- **Typical Measurement Time:** 20-40sec**

*In combination with the BP1M2 Series Extension Set, the repetition rate must be ≥300kHz
**Depending on beam shape and settings

## Features

- Automated Accurate $M^2$ and Beam Quality Measurements
- Measures Divergence, Waist Diameter, Rayleigh Range, and Astigmatism
- Compatible With CW and Quasi-CW/ Pulsed Laser Sources
- Short Measurement Times
- Includes Laser Focusability Test
- ISO11146 Compliant
- Flexible Data Export: Text & Excel Files or Live Data Readout via TCP/IP to a DataSocket Server

| ITEM# | $ | £ | € | RMB | DESCRIPTION |
|---|---|---|---|---|---|
| BP1M2-50 | $3,120.00 | £ 1,965.60 | € 2.901,60 | ¥ 29,796.00 | $M^2$ Beam Propagation Analyzer Extension Set, Translation Length 50mm |
| BP1M2-150 | $3,504.00 | £ 2,207.50 | € 3.258,70 | ¥ 33,463.20 | $M^2$ Beam Propagation Analyzer Extension Set, Translation Length 150mm |
| BP1M2-300 | $4,980.00 | £ 3,137.40 | € 4.631,40 | ¥ 47,559.00 | $M^2$ Beam Propagation Analyzer Extension Set, Translation Length 300mm |