

# PRESENTATION

## OVERVIEW OF THE DIFFERENT MODELS

Gentec-EO has a large choice of beam diagnostic tools. from CCD cameras to scanning systems and even position sensing detectors, we have all you need to characterize your beam.



See page 164

### BEAMAGE

- 1/2 in & 2/3 in CCD Cameras
- 1.4 MPixels
- UV to IR Wavelengths
- Sensor Size up to 8.8 x 6.6 mm
- USB Powered and Controlled

### 1/2 in and 2/3 in CCD CAMERAS



See page 166

### BEAMAGE FOCUS

- 1/2 in & 2/3 in CCD Cameras with Fiber Tapers
- For Large Beams up to 20 x 15 mm
- 1.4 MPixels
- UV to IR Wavelengths
- USB Powered and Controlled

### 1/2 in and 2/3 in CCD CAMERAS WITH FIBER TAPERS FOR LARGE BEAMS



See page 168

### BEAM'R2

- Scanning Slit Beam Profiler
- XY Slit Planes
- Si, InGaAs and Extended InGaAs Sensors
- Sensor Size up to 6 x 5 mm

### XY SCANNING SLITS



See page 168

### BEAMMAP2

- Scanning Slit Beam Profiler
- XYZ $\phi$  Slit Planes
- Real Time M2, Divergence and Collimation
- Si, InGaAs and Extended InGaAs Sensors
- Sensor Size up to 6 x 5 mm

### XYZ $\phi$ SCANNING SLITS

### REAL TIME M2, DIVERGENCE AND COLLIMATION

MONITORS  
ENERGY DETECTORS  
POWER DETECTORS  
PHOTO DETECTORS  
THZ DETECTORS  
OEM DETECTORS  
CALORIMETERS  
SPECIAL PRODUCTS  
BEAM DIAGNOSTICS

# COMPARISON TABLE

MONITORS

ENERGY DETECTORS

POWER DETECTORS

PHOTO DETECTORS

THZ DETECTORS

OEM DETECTORS

CALORIMETERS

SPECIAL PRODUCTS

BEAM DIAGNOSTICS



See page 170

## BEAMSCOPE-P8

- Scanning Probe Beam Profiler
- Pinholes, Single Slits or XY Slits Available
- Real Time Measurement of : XY Profile, Angular Divergence, Ellipticity, Centroid Position, Gaussian Fit and more
- 2D or 3D Plots
- For Large Beams up to 40 x 23 mm (with M2 Stage)

## SCANNING PROBE PROFILERS

## COMPARISON TABLE

MODEL	PROFILE	M2	SCAN	KNIFE EDGE	CCD	PULSED LASERS	RESOLUTION	MAX IMAGE SIZE	SEE PAGE
Beamage	X-Y	Option			✓	< 20 kHz	1 µm	8.8 x 6.6 mm	164
Beamage Focus	X-Y				✓	< 20 kHz	1.6 µm	20 x 15 mm	166
Beam'R2	X-Y		✓			> 100 kHz	0.5 µm	6 x 5 mm	168
BeamMap2	X-Y-Z-θ-φ	Real Time	✓	✓		> 100 kHz	0.5 µm	6 x 5 mm	168
BeamScope-P8	X-Y	Option	✓			> 10 kHz	0.1 µm	40 x 23 mm	170

# BEAMAGE

1/2 in and 2/3 in CCD Cameras



## KEY FEATURES

- 1 Plug and Play**  
Direct USB2.0 connection
- 2 For CW or Pulsed Lasers**  
Suitable for both CW and pulsed lasers, with single pulse capture up to 20 kHz
- 3 User-Friendly Software**
  - Background capture and subtraction
  - XY profiles and centroids
  - Gaussian and top hat fits
  - Beam wander tool
- 4 Auto Trigger**  
Automatically synchronizes to pulsed lasers
- 5 M2 Capabilities**  
With optional M2 stage and lenses

## AVAILABLE MODELS



Beamage-CCD12  
(1/2 in CCD Camera)



Beamage-CCD23  
(2/3 in CCD Camera)



## AVAILABLE SENSORS

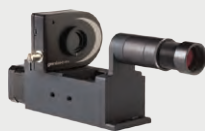
4 Sensor choices for each size:

- Standard Si 350 - 1150 nm
- -1310 1290 - 1350 nm
- -IR 1480 - 1680 nm
- With UG11 Filter 260 - 380 nm

## ACCESSORIES



Stand with Delrin Post  
(Model Number: 200428)



M2 Stage (M2DU)



CUB, CUB-UV & EAM-2  
Beam Splitters and Attenuators



Stackable ND Filters  
(0.5, 1.0, 2.0, 3.0 & 4.0)



UV Converters &  
IR Adaptors



Pelican Carrying Case

## SEE ALSO

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# BEAMAGE



## SPECIFICATIONS

MODELS	BEAMAGE-CCD12	BEAMAGE-CCD23
SENSOR TECHNOLOGY	CCD	CCD
EFFECTIVE APERTURE	6.3 x 4.8 mm	8.8 x 6.6 mm

MEASUREMENT CAPABILITY		
Pixel Count	1.4 MPixels	1.4 MPixels
H x V	1360 x 1024	1360 x 1024
Pixel Dimension	4.65 x 4.65 $\mu$ m	6.45 x 6.45 $\mu$ m
Minimum Measurable Beam	~47 $\mu$ m	~65 $\mu$ m
Shutter Type	Synchronous	Synchronous
Maximum Full Frame Rate	~10 Hz	~10 Hz
Single Pulse Capture	20 kHz	20 kHz
Signal to RMS Noise	1000:1	1000:1
Electronic Shutter Dynamic Range	43 dB	43 dB
ADC	14 bit	14 bit
WAVELENGTH RANGES		
Standard	350 - 1150 nm	350 - 1150 nm
-1310 (residual silicon response) <sup>a</sup>	1290 - 1350 nm	1290 - 1350 nm
-IR (with Phosphor coating) <sup>b</sup>	1480 - 1680 nm	1480 - 1680 nm
With UG11 Filter (for UV) <sup>c</sup>	260 - 380 nm	260 - 380 nm
DAMAGE THRESHOLDS <sup>d</sup>		
Maximum Average Power <sup>e</sup>	1 W	1 W
Saturation Level (1064 nm)		
Continuous Laser	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>
Pulsed Laser	300 $\mu$ J/cm <sup>2</sup>	300 $\mu$ J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Sensor Size	6.3 x 4.8 mm	8.8 x 6.6 mm
Dimensions (not including filter)	61H x 81.1W x 22.9D mm	61H x 81.1W x 22.9D mm
Weight (head only)	230 g	230 g
ORDERING INFORMATION		
Full Product Name	BEAMAGE-CCD12	BEAMAGE-CCD23
Product Number (Stand not included)	201027	201028

a. With 1290 nm long-pass filter instead of ND4.

b. A standard Si chip camera can also be fitted with a cam-IR adaptor for NIR detection.

c. A standard Si chip camera can also be fitted with a UV converter for profiles down to 190 nm.

d. With ND4 filter.

Specifications are subject to change without notice

# BEAMAGE FOCUS

1/2 in and 2/3 in CCD Cameras with Fiber Tapers for Large Beams



## KEY FEATURES

- 1 Large Area Fiber Tapers**  
2 sizes for large beams:
  - Focus I: 11 x 14 mm
  - Focus II: 20 x 15 mm
- 2 Plug and Play**  
Direct USB2.0 connection
- 3 For CW or Pulsed Lasers**  
Suitable for both CW and pulsed lasers, with single pulse capture up to 20 kHz
- 4 User-Friendly Software**
  - Background capture and subtraction
  - XY profiles and centroids
  - Gaussian and top hat fits
  - Beam wander tool
- 5 Auto Trigger**  
Automatically synchronizes to pulsed lasers

## AVAILABLE MODELS



Beamage-Focus I-CCD12 (14.4 x 10.8 mm Taper) + Beamage-Focus II-CCD23 (20 x 15 mm Taper)

## AVAILABLE SENSORS

3 Sensor choices for each size:

- Standard Si 350 - 1150 nm
- -1310 1290 - 1350 nm
- -IR 1480 - 1680 nm

## ACCESSORIES



Stand with Delrin Post (Model Number: 200428)



Stackable ND Filters (Focus I) (0.5, 1.0, 2.0, 3.0 & 4.0)



Stackable NDL Filters (Focus II) (0.5, 1.0, 2.0, 3.0 & 4.0)



CUB, CUB-UV & EAM-2 Beam Splitters and Attenuators



Pelican Carrying Case

## SEE ALSO

- ACCESSORIES FOR BEAM DIAGNOSTICS 172
- LIST OF ALL ACCESSORIES 174

MONITORS ENERGY DETECTORS POWER DETECTORS PHOTO DETECTORS THZ DETECTORS OEM DETECTORS CALORIMETERS SPECIAL PRODUCTS BEAM DIAGNOSTICS

# BEAMAGE FOCUS



## SPECIFICATIONS

MODELS	BEAMAGE FOCUS I	BEAMAGE FOCUS II
SENSOR TECHNOLOGY	CCD	CCD
EFFECTIVE APERTURE	14.4 x 10.8 mm	20 x 15 mm

### MEASUREMENT CAPABILITY

Pixel Count	1.4 MPixels	1.4 MPixels
H x V	1360 x 1024	1360 x 1024
Pixel Dimension	10.5 x 10.5 $\mu$ m	14.5 x 14.5 $\mu$ m
Minimum Measurable Beam	~105 $\mu$ m	~145 $\mu$ m
Pixel Multiplying Factor (PMF)	2.25	2.27
Shutter Type	Synchronous	Synchronous
Maximum Full Frame Rate	~10 Hz	~10 Hz
Single Pulse Capture	20 kHz	20 kHz
Signal to RMS Noise	1000:1	1000:1
Electronic Shutter Dynamic Range	43 dB	43 dB
ADC	14 bit	14 bit

### WAVELENGTH RANGES

Standard	350 - 1150 nm	350 - 1150 nm
-1310 (residual silicon response) <sup>a</sup>	1290 - 1350 nm	1290 - 1350 nm
With UG11 Filter (for UV) <sup>b</sup>	260 - 380 nm	260 - 380 nm

### DAMAGE THRESHOLDS <sup>c</sup>

Maximum Average Power	1 W	1 W
Saturation Level (1064 nm)		
Continuous Laser	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>
Pulsed Laser	300 $\mu$ J/cm <sup>2</sup>	300 $\mu$ J/cm <sup>2</sup>

### PHYSICAL CHARACTERISTICS

Effective Aperture	14.4 x 10.8 mm	20 x 15 mm
Sensor Size	6.3 x 4.8 mm (CCD12)	8.8 x 6.6 mm (CCD23)
Dimensions	61H x 81.1W x 48.6D mm	61H x 81.1W x 57.3D mm
Weight (head only)	310 g	310 g

### ORDERING INFORMATION

Full Product Name	BEAMAGE FOCUS I	BEAMAGE FOCUS II
Product Number (Stand not included)	201112	201074

a. With 1290 nm long-pass filter instead of ND4.  
a. A standard Si chip camera can also be fitted with a UV converter for profiles down to 190 nm.  
b. With ND4 filter.

Specifications are subject to change without notice

# BEAMR2-BEAMMAP2

Scanning Slits Beam Profilers

## KEY FEATURES



**1 Plug and Play**

Direct USB2.0 connection

**2 Beam'R2**

Each single plane XY beam profiling head contains a 2.5  $\mu\text{m}$  slit pair for high dynamic range slit mode & a 25  $\mu\text{m}$  slit pair for 0.1  $\mu\text{m}$  resolution Knife-Edge mode

**3 BeamMap2**

Adds multiple Z-plane scanning to allow the measurement of:

- Real-time XYZ profiles, Focus position
- Real-time M2, Divergence, Collimation

**4 True2D Slits**

0.4  $\mu\text{m}$  thick metallic multilayer films on a sapphire substrate avoid the tunnel effect of air slits

## AVAILABLE MODELS



Beam'R2  
(XY Planes)



BeamMap2  
(XYZ $\Phi$  Planes)



## AVAILABLE SENSORS

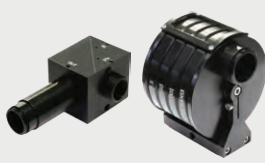
3 Sensor choices for each model:

- Standard Si 190 - 1050 nm
- InGaAs 675 - 1750 nm
- Extended InGaAs 0.8 - 2.5  $\mu\text{m}$

## ACCESSORIES



Stand with Delrin Post  
(Model Number: 200428)



CUB, CUB-UV & EAM-2  
Beam Splitters and Attenuators



Pelican Carrying Case

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# BEAMR2-BEAMMAP2



## SPECIFICATIONS

MODELS	BEAMR2	BEAMMAP2
SLIT-SCAN PLANES	XY	XYZΦ

### MEASUREMENT CAPABILITY

#### Dimensions of Capture Region

	BEAMR2	BEAMMAP2
Si	5 mm	5mm
InGaAs	3 mm	3mm
Extended InGaAs	1.5 mm	1.5 mm
Laser Types	CW or Pulsed (> 100 kHz)	CW or Pulsed (> 100 kHz)
Waist Diameters ( $2\omega_0$ )	0.5 - 1500 $\mu\text{m}$	0.5 - 1500 $\mu\text{m}$
Waist Diameter Resolution	0.2 % of beam diameter	0.2 % of beam diameter
Best Resolution	0.1 $\mu\text{m}$	0.1 $\mu\text{m}$
Precisions		
Beam Divergence	N/A	$\pm 1$ mrad over a $\pm 100$ mrad range
Beam Pointing	N/A	$\pm 1$ mrad over a $\pm 100$ mrad range
Beam $M^2$	N/A	$\pm < 5\%$ , $M^2 = 1.0$ to $> 20$
Waist Centroid Position	$\pm 2$ $\mu\text{m}$ rms	$\pm 2$ $\mu\text{m}$ rms
Auto Gain Range	40 dB (10 000:1)	40 dB (10 000:1)
Update Rate	5 Hz	5 Hz

### WAVELENGTH RANGES

	BEAMR2	BEAMMAP2
Si	190 - 1050 nm	190 - 1050 nm
InGaAs	675 - 1750 nm	675 - 1750 nm
Extended InGaAs	0.8 - 2.5 $\mu\text{m}$	0.8 - 2.5 $\mu\text{m}$

### DAMAGE THRESHOLDS

	BEAMR2	BEAMMAP2
Maximum Average Power	1 W	1 W
Maximum Irradiance		
> 500 nm	0.5 mW/ $\mu\text{m}^2$	0.5 mW/ $\mu\text{m}^2$
< 500 nm	0.25 mW/ $\mu\text{m}^2$	0.25 mW/ $\mu\text{m}^2$

### PHYSICAL CHARACTERISTICS

	BEAMR2	BEAMMAP2
Scanned Areas		
Si	6 x 5 mm	6 x 5 mm
InGaAs	4 x 5 mm	4 x 5 mm
InAs	2.5 x 5 mm	2.5 x 5 mm
Dimensions	61.0H x 67.3W x 68.2D mm	61.0H x 67.3W x 68.2D mm
Weight (head only)	450 g	450 g

### ORDERING INFORMATION

Full Product Names	BEAMR2	BEAMMAP2
Si	BR2-Si	BMS2-4XY250*-Si
InGaAs	BR2-IGA	BMS2-4XY250*-IGA
Extended InGaAs	BR2-IGA-X.X	BMS2-4XY250*-IGA-X.X

\* Default unit has 250  $\mu\text{m}$  plane spacing. 50, 100, 500, 750 & 5000  $\mu\text{m}$  plane spacings available

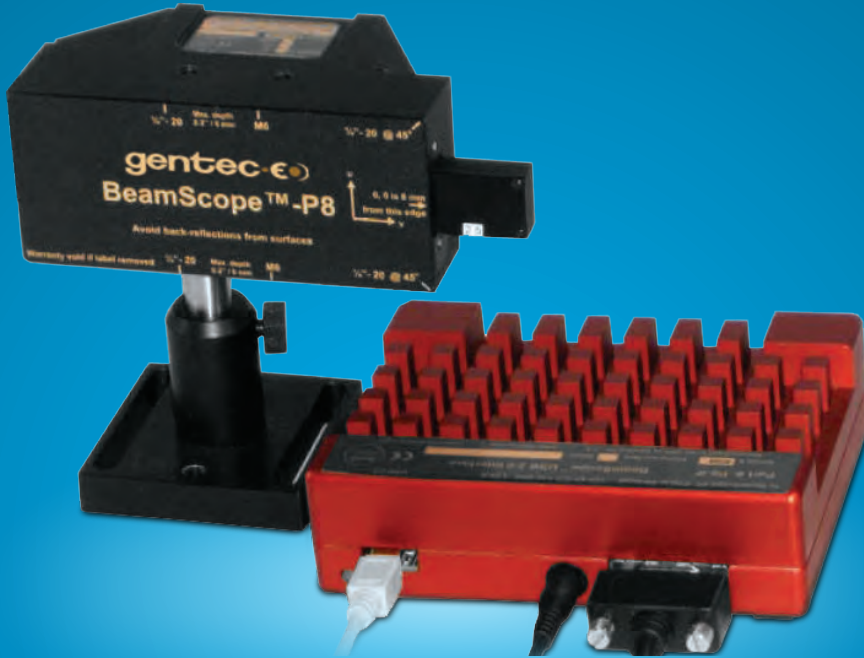
Specifications are subject to change without notice

# BEAMSCOPE-P8

Scanning Probe Beam Profiler

## KEY FEATURES

- 1 Plug and Play**  
Direct USB2.0 connection
- 2 Real-Time Measurements**
  - X-Y profile
  - Angular divergence
  - Ellipticity, Centroid and Gaussian fit
  - Relative power
- 3 Wide Range of Beam Diameters**
  - Can profile beams as small as 3 mm in diameter to 40 x 23 mm (with the 2D-stage)
- 4 Wide Wavelength Range**  
From 190 nm to 4 μm
- 5 High Resolution**  
Down to 0.5 mm (or 0.5 %)



## AVAILABLE MODELS



BS-PA  
(Pinhole Aperture)



BS-SS  
(Single Slits)



BS-XY  
(XY Slits)



## AVAILABLE SENSORS

3 Sensor choices for each model:

- Standard Si      190 - 1150 nm
- Ge                    800 - 1800 nm
- InAs                 1.5 - 3.5 μm

## ACCESSORIES



Stand with Delrin Post  
(Model Number: 200428)



M2-Stage

M2 Stage (M2DU)



CUB, CUB-UV & EAM-2  
Beam Splitters and Attenuators



Pelican Carrying Case

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# BEAMSCOPE-P8



## SPECIFICATIONS

### MODELS

BEAMSCOPE-P8

### APERTURE TYPES

Pinholes, Single Slit, X-Y Slits

### MEASUREMENT CAPABILITY

#### Measured Profile Parameters

Gaussian beam diameter, Gaussian fit,  
Second moment beam diameter,  
Knife-edge beam diameter,  
Centroid position (relative & absolute)

#### Displayed Profiles

Beam wander display  
X only, Y only, X & Y  
2-D plot, 3-D plot

#### Laser Types

CW or Pulsed (&gt; 10 kHz)

#### Waist Diameters

2  $\mu\text{m}$  - 15 mm

#### Measurement Resolution

<0.1  $\mu\text{m}$ , or 0.1 % of beam diameter

#### Optical Dynamic Range

42.5 dB optical (23 000:1)

#### Update Rate

&gt;1 Hz typical, 2 Hz maximum

### WAVELENGTH RANGES

#### Si

190 - 1150 nm

#### Ge

800 - 1800 nm

#### InAs

1.5 - 3.5  $\mu\text{m}$ 

### DAMAGE THRESHOLDS

#### Maximum Average Power

1 W

#### Maximum Irradiance

&gt; 500 nm

0.5 mW/ $\mu\text{m}^2$ 

&lt; 500 nm

0.25 mW/ $\mu\text{m}^2$ 

### PHYSICAL CHARACTERISTICS

#### Scanned Areas

Pinholes (PA Series)

Line Scan – Pinhole diameter x 23 mm

Single Slits (SS Series)

Rectangle – Si: 7 x 23 mm, Ge: 5 x 23 mm, InAs: 3 x 23 mm

X-Y Slits (XY Series)

Trapezoid – Si: 5 x 15/5 mm, Ge: 3 x 15/5, InAs: 2 x 15/5 mm

2D-Stage (M2DU)

Rectangle – 40 x 23 mm

#### Dimensions

51H x 115W x 62D mm

#### Weight (head only)

540 g

### ORDERING INFORMATION

#### Full Product Name

PA

SS

XY

Si

BS8-PAxx

BS8-SSyy

BS8-XYyy

Ge

BS8G-PAxx

BS8G-SSyy

BS8G-XYyy

InAs

BS8IA-PAxx

BS8IA-SSyy

BS8IA-XYyy

xx: For pinhole apertures, replace xx by 5, 10, 25, 50 or 100 (mm)

yy: For single and dual slits, replace yy by 2.5, 5, 10, 25, 50 or 100 (mm)

Specifications are subject to change without notice

# ACCESSORIES FOR BD

## M2DU - M2 STAGE FOR BEAMAGE



### DESCRIPTION

The USB 2.0 interfaced M2DU accessory converts any Beamage-CCDXX series beam profiling camera into a compact ISO 11146 compliant M2 measurement system. The M2DU system comprises a lens fixed to the front of a moving stage on which the Beamage camera moves up to 44 mm. An 85 mm focal length, 400 to 900 nm, achromat refocuses an input beam to a waist within the stage travel range. (Alternative lens focal lengths and coatings will be recommended/supplied for some applications.) Sampling in accordance with the ISO 11146 standard measures the hyperbolic region about the waist. A least squares hyperbolic fit to the second moment diameter data allows calculation of the M2 value and related parameters.

### SPECIFICATIONS

**Beam Diameters:** See Graph

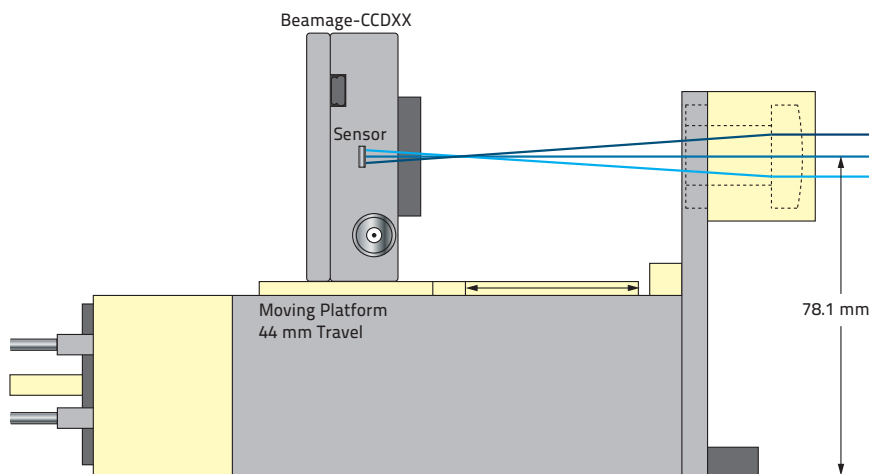
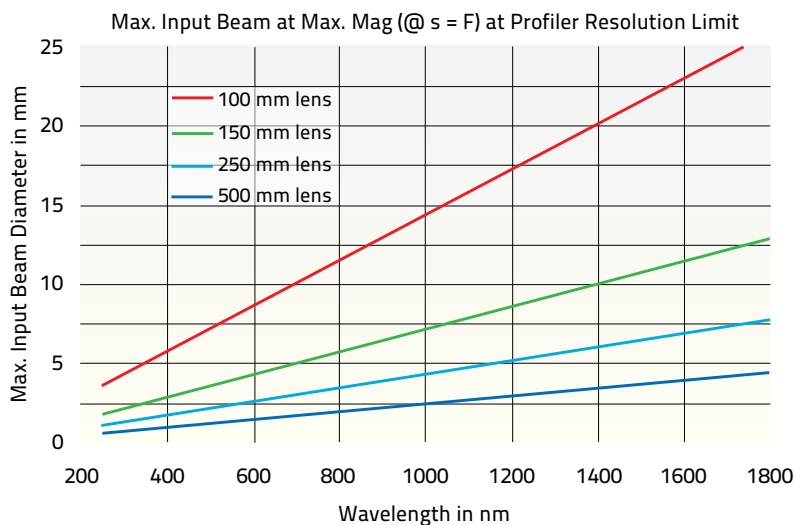
**Wavelengths:**

- UV:** 250 - 450 nm
- VIS:** 400 - 800 nm
- NIR:** 630 - 1050 nm
- TEL:** 1000 - 1800 nm

**M2 Repeatability:** ±2 %

**Focal Lengths:**

- 100 nm** (25 mm Ø)
- 150 nm** (25 mm Ø)
- 250 nm** (25 mm Ø)
- 500 nm** (50 mm Ø)



### OPERATION

Operation includes an Auto scan range mode which simplifies scanning a range in accordance with the ISO standard, and is described fully in the Application Note which accompanies the stage. An initial 20-point scan with an Average of 2 images at each position is performed over the total range of the stage. The software then establishes the optimal scan range for M2 measurement in accordance with the Standard. Averaging is set to 5 images per position and 60 equispaced positions in z about the beamwaist. A typical full scan takes 5 minutes, but coarser scans may be performed faster.

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# ACCESSORIES FOR BD

## EAM2 - VARIABLE ATTENUATOR



### DESCRIPTION

EAM-2 is a simple-to-use variable attenuator. It consists of a bank of four filter wheels, each with three different filters ranging from 100% transmission down to 0.003%. This filter bank offers almost continuous attenuation from 0 to more than 93 dB (Optical Density > 9).

The EAM-2 has three M6 mounting holes and can also connect directly to the C-mount port of a camera. EAM-2 uses Schott NG absorbing filter glass (NG). The filters are laser grade polished to 10-5 scratch-dig and  $\lambda/10$  finish. All filters are mounted at a  $4^\circ$  angle to suppress back-reflection interference fringes

### SPECIFICATIONS

Maximum Attenuation:	93 dB (OD9)
Minimum Attenuation:	0dB
Maximum Power Density:	1 W/cm <sup>2</sup>
Maximum Energy Density:	100 mJ/cm <sup>2</sup>
Wavelength Range:	350 - 2200 nm
Clear Aperture:	18 mm $\varnothing$
Angle:	4°
Mounting:	3 x M6, C-Mount

		Wheel #							
		1		2		3		4	
		dB	%	dB	%	dB	%	dB	%
Filter #	1	0	100	0	100	0	100	0	100
	2	0.5	90	5	30	20	1	35	0.03
	3	1	80	10	10	25	0.3	40	0.01
	4	3	50	15	3	30	0.1	45	0.0003

## CUB & CUB-UV - BEAM SPLITTER CUBES



### DESCRIPTION

The CUB beam splitter cube takes a fixed ratio beam sample. It uses the front surface reflection from an uncoated laser mirror to achieve a reflection of 3% to 10% of the main laser beam for further analysis.

The surface is polished to 10-5 scratch-dig and  $\lambda/10$  wave finish, wedged at 10 arcmin to avoid interference fringes and can take power densities up to 2 MW/cm<sup>2</sup>. Like the EAM attenuator it has C-Mount ports and can be connected to the EAM and your camera with the ETCM connecting tubes. It can post mount from an M6 threaded post.

### SPECIFICATIONS

Attenuation:	3% to 10% (Polarization dependent)
Spectral Range:	
CUB:	350 - 2200 nm
CUB-UV:	190 - 2200 nm
Clear Aperture:	19 mm
Damage Threshold:	50 J/cm <sup>2</sup>

### Part #

### Description

CUB	Beam Splitter
CUB-UV	UV Beam Splitter
ETCM-2	Tube Set with 2 Tubes (2 x 50 mm tubes + 4 adaptor rings)
ETCM-3	Tube Set with 3 Tubes (3 x 50 mm tubes + 4 adaptor rings)