

# ACCESSORIES

Specifications



IF YOUR **LASER SPECIFICATIONS EXCEED THE LIMITS** IN TERMS OF

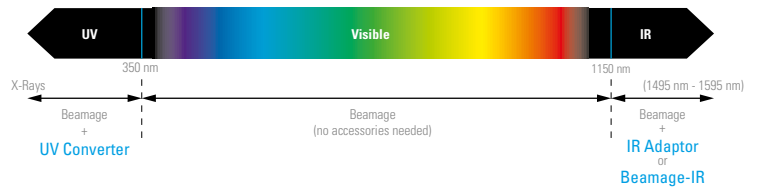
- > **WAVELENGTH**
- > **BEAM SIZE**
- > **LASER POWER**

YOU CAN MANAGE THEM WITH THE ACCESSORIES PRESENTED BELOW

## MANAGE THE WAVELENGTH



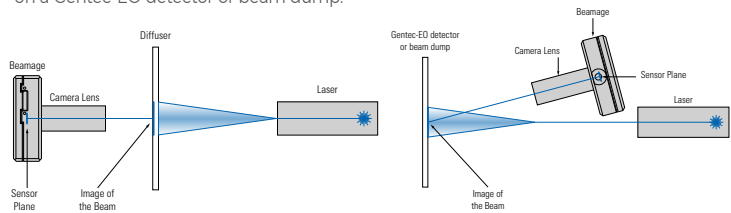
Since CMOS sensors are not sensitive to every frequency of the electromagnetic spectrum, we offer several wavelength management solutions to enhance the capabilities of the Beamage beam profiling cameras.



## MANAGE THE BEAM SIZE



A simple solution is offered to those who need to profile beams that are larger than the CMOS sensor (> 11.3 mm x 11.3 mm). This solution is a beam reducing optical component called camera lens. It works either by indirectly imaging the transmission of the beam after it has passed through a diffusing element or by directly imaging the beam that is incident on a Gentec-EO detector or beam dump.



## MANAGE THE LASER POWER



CMOS sensors have low saturation levels as well as low damage thresholds. It is thus very important that you control your laser power to get the best measurement possible and avoid damaging the Beamage camera.

- For laser power under 1 W, you can attenuate the beam with ND filters
- For laser power up to 1000 W, you can sample a small fraction of the beam with a BA optical sampler

# ND

Neutral density (ND) filters - up to 1 W



## KEY FEATURES

- **FOR ALL BEAMAGE MODELS**  
We offer various SM1-threaded absorptive ND filters that can be fixed directly on the aperture of the Beamage camera via a SM1 to C-mount adaptor. We also offer SM2-threaded filters that can be fixed on the Beamage-4M-FOCUS via a SM2 to T-Mount adaptor.
- **HIGH-QUALITY OPTICS**  
These filters reduce the intensity of all wavelengths without affecting the wavefront of the beam or distorting the image.
- **STACKABLE ATTENUATION**  
Subsequent filters can be stacked directly on each other. Sets of 3 filters or 6 filters as well as individual filters are available.

## COMPATIBLE PRODUCTS



BEAMAGE-4M



BEAMAGE-4M-FOCUS



PH series

## OVERVIEW OF THE MODELS

MODEL NAME		EQUIVALENT ATTENUATION	TRANSMITTANCE AT 633 NM
<b>SM1 FILTERS</b>	<b>SM2 FILTERS</b>		
ND0.5	ND0.5-FOCUS	(1/3.16)	~32%
ND1.0	ND1.0-FOCUS	(1/10)	~10%
ND2.0	ND2.0-FOCUS	(1/100)	~1%
ND3.0	ND3.0-FOCUS	(1/1000)	~0.1%
ND4.0	ND4.0-FOCUS	(1/10 000)	~0.01%
ND5.0	ND5.0-FOCUS	(1/100 000)	~0.001%
NDSET-6 (Set of 6 filters)			
NDSET-3 (Set of 3 filters: ND1, ND2, ND3)			
ND-H (ND filter holder)			

# ND

Specifications

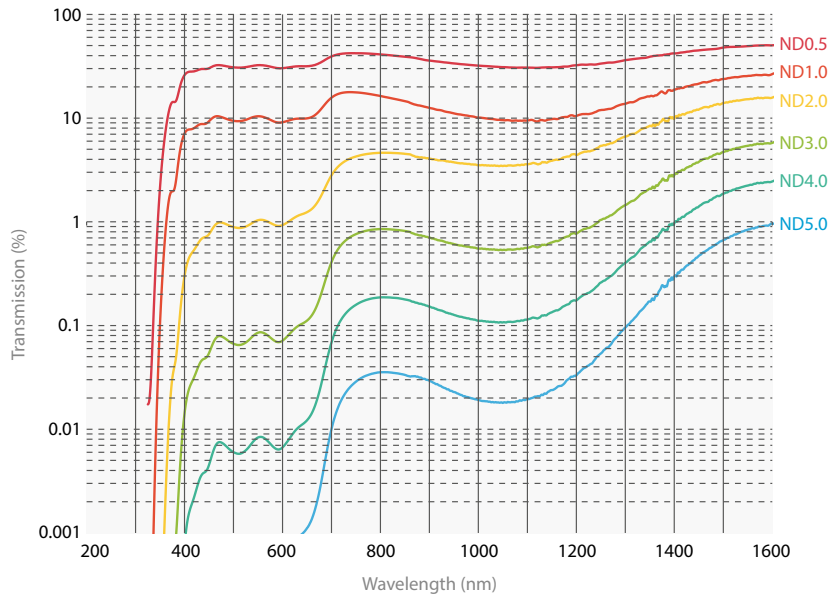


## ND0.5 TO ND5.0

Spectral range	400 nm* - 1595 nm
Filter diameter	25 mm $\phi$
Clear aperture	22.5 mm $\phi$ (90% of diameter)
Dimensional tolerance	+0.0/-0.25 mm
Optical density tolerance	$\pm 5\%$
Parallelism	<10 arcsec
Transmitted wavefront error	< $\lambda/10$ at 633 nm
Surface flatness	< $\lambda/4$
Surface quality	40 - 20 Scratch-Dig
Maximum power	1 W
Damage thresholds	100 W/cm <sup>2</sup> or 3 J/cm <sup>2</sup>
Product page	

\* Data specified at 633 nm  
a. For ND4.0 filter, lower limit with other models.

## SPECTRAL TRANSMISSION OF ALL FILTERS



Specifications are subject to change without notice

# BA

Optical attenuators - up to 1 kW



## MULTIPLES USES

- > Monitor power and beam profile simultaneously
- > Polarization insensitive beam-splitter with no back-reflections
- > Optical pick-off for use with our energy or power detectors
- > Attenuator for our high sensitivity detectors like M6 series and PH series

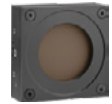
## COMPATIBLE PRODUCTS



BEAMAGE-4M



BEAMAGE-4M-FOCUS  
(for BA32-1KW only)



UP55N-40S-H9  
(for BA32-1KW only)



PH series



M6 series

## KEY FEATURES

- > **MANAGE THE LASER POWER**  
CMOS sensors have low saturation levels as well as low damage thresholds. It is thus very important that you control your laser power to get the best measurement possible and avoid damaging the BEAMAGE camera.
- > **SAMPLE YOUR LASER BEAM**  
The BA series optical attenuators use Fresnel reflections on two orthogonal wedges to pick off a small fraction of the input beam. The incoming beam polarization state and irradiance are preserved.
- > **IMPROVED MECHANICS**  
The BA16 models are now compatible with 30-mm cage systems and also include SMI threads on the input face

## ACCESSORIES



BA32 mounting kit for  
BEAMAGE-4M



BA32 mounting kit for  
BEAMAGE-4M-FOCUS







BA32 mounting kit for  
UP55N-40S-H9

# BA

## Specifications



	BA16-60S	BA16K-150S-H5-D0	BA16K-500F-H9-D0	BA32-1KW
<b>MAXIMUM POWER</b>	60 W	150 W	500 W	1000 W
<b>EFFECTIVE APERTURE</b>	16 mm $\phi$	16 mm $\phi$	16 mm $\phi$	32 mm $\phi$
<b>COOLING METHOD</b>	Convection	Convection	Fan	Water
<b>MEASUREMENT CAPABILITY</b>				
<b>Spectral range</b>	200 - 2100 nm	200 - 2100 nm	200 - 2100 nm	200 - 2100 nm
<b>Integrated power detector</b>	N/A	UPI9K-15S-H5-D0	UPI9K-110F-H5-D0	Compatible with UP55 series (not included)
<b>Fan input voltage</b>	N/A	N/A	12 VDC	N/A
<b>Equivalent attenuation</b>	1/1700 @ 1064 nm	1/1700 @ 1064 nm	1/1700 @ 1064 nm	1/1900 @ 1064 nm
<b>Optical wedges material</b>	UV fused silica (uncoated)	UV fused silica (uncoated)	UV fused silica (uncoated)	UV fused silica (uncoated)
<b>Residual beam deviation</b>	5.6°	5.6°	5.6°	3.6° @ 1064 nm
<b>Polarization correction</b>	Yes (pair of orthogonal wedges)	Yes (pair of orthogonal wedges)	Yes (pair of orthogonal wedges)	Yes (pair of orthogonal wedges)
<b>DAMAGE THRESHOLDS</b>				
<b>Maximum power</b>	60 W	150 W	500 W	1000 W
<b>Maximum average power density</b>	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>
<b>Maximum energy density</b>	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>
<b>PHYSICAL CHARACTERISTICS</b>				
<b>Aperture diameter</b>	16 mm $\phi$	16 mm $\phi$	16 mm $\phi$	32 mm $\phi$
<b>Dimensions</b>	45H x 47W x 81D mm	54H x 50W x 91D mm	54H x 54H x 126D mm	145H x 250W x 132D mm
<b>Weight</b>	0.26 kg	0.37 kg	0.46 kg	5.5 kg
<b>Mounting thread</b>	SM1	SM1	SM1	SM2
<b>Included adaptor</b>	SM1 external threaded tube	SM1 external threaded tube	SM1 external threaded tube	N/A
<b>ORDERING INFORMATION</b>				
<b>Compatible Stand</b>	STAND-S-233	STAND-S-233	STAND-S-233	2x STAND-S-443-C-M
<b>Product Page</b>				

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# UV CONVERTERS

Wavelength management



UV Converters take advantage of a phenomenon called fluorescence to extend the performance range of the Beamage beam profiling camera to ultraviolet wavelengths. A fluorescent crystal located at the entrance of the converter absorbs UV wavelengths and reemits longer wavelengths (in the visible spectrum), which are less energetic and detected by the CMOS sensor.

## MAIN CHARACTERISTICS

- Transforms wavelengths contained between X-rays and 400 nm to visible and near-IR wavelengths.
- Images larger beams due to the magnification properties of the optics.
- Built with an iris at the output port for a control of the exposure on the CMOS sensor.
- Removable extension tube that is easily fixed onto the entrance port of the Beamage camera.
- Ready to use within minutes

## SPECIFICATIONS

	BSF23C11.3N	BSF23P11.3N	BSF23R11.3N	BSF23G11.3N
Input Aperture Ø	23 mm	23 mm	23 mm	23 mm
Overall Length (OAL)	97 mm	97 mm	97 mm	97 mm
Magnification	1.4	1.4	1.4	1.4
Crystal Type	C	P	R	G
Wavelength range	110 - 225 nm	10 - 350 nm	110 - 532 nm	X-ray - 400 nm
Saturation level				
193 nm	400 mJ/cm <sup>2</sup>	30 mJ/cm <sup>2</sup>	50 mJ/cm <sup>2</sup>	10 mJ/cm <sup>2</sup>
248 nm	N/A	30 mJ/cm <sup>2</sup>	400 mJ/cm <sup>2</sup>	10 mJ/cm <sup>2</sup>
308 nm	N/A	50 mJ/cm <sup>2</sup>	400 mJ/cm <sup>2</sup>	50 mJ/cm <sup>2</sup>
Decay time	3 - 5 µs	5 µs	4000 µs	0.1 µs
Max repetition rate	20 - 30 kHz	20 kHz	25 Hz	20 kHz
Product page				

A complete procedure on how to choose the appropriate UV Converter (UV Converter Application Note) is available on our website at [www.gentec-eo.com](http://www.gentec-eo.com).

# IR ADAPTOR

Wavelength management




Typically, a CMOS silicon sensor is operating at its full potential when imaging lasers with wavelengths between 350 nm and 1150 nm. If you want to extend the performance range of your Beamage beam profiling camera to the near-IR telecom wavelengths band, you can use the IR Adaptor. This ideal solution takes advantage of a multi-photon absorption process to extend the sensitivity range of the camera sensor to a portion of the near-IR spectrum (1495 nm - 1595 nm).

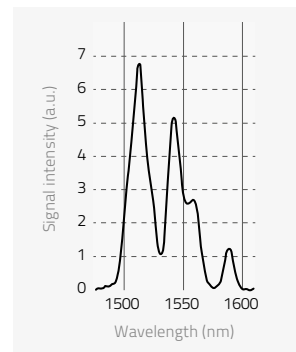
## MAIN CHARACTERISTICS

- Converts wavelengths between 1495 nm and 1595 nm to shorter wavelengths between 950 nm and 1075 nm.
- Images larger beams due to the convergent properties of the optics (3.29X).
- Built with a high quality coated anti-reflection input window that allows wavelength conversion with low distortion and maximum image resolution.
- Removable and easily C-mounted onto the entrance port of the camera.
- Ready to use within minutes.

## SPECIFICATIONS

IR ADAPTOR	
Active area	27.5 mm Ø
IR spectral range	1495 nm - 1595 nm
Peak IR sensitivity	1510 nm and 1540 nm
Converted wavelengths	950 nm - 1075 nm
Pixel Multiplication Factor	3.29
Minimum beam size	230 µm
Maximum beam size	19 mm
Maximum resolution	12 lp/mm over active area 40 lp/mm at sensor focal plane
Distortion	-1.0% barrel distortion (inverted image)
Linearity	Non-Linear, IR converted output ~ IR input intensity <sup>1,4)</sup>
Spectral transmission	360 nm - 2000 nm at F30.8
Damage threshold	1 W/cm <sup>2</sup>
Dimensions	46 mm Ø x 97 mm L
Operating temperature	-10°C to +40°C
Weight	210 g
Product page	

## EXCITATION SPECTRUM



Specifications are subject to change without notice


# FILTERS

Wavelength management

## UV BANDPASS FILTER

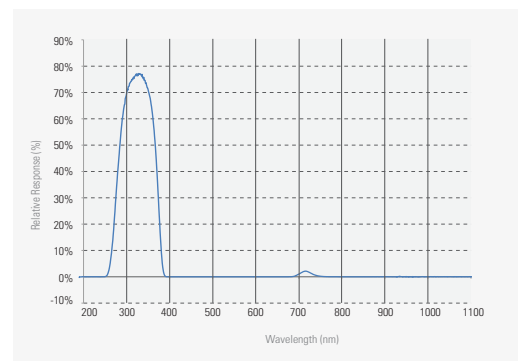
We also offer a color glass filter specially designed for the UV spectrum. Depending on the wavelength, the UG11-UV filter transmits 20 % to 70 % of the input beam power. It is particularly useful for applications with wavelengths contained between 250 nm and 370 nm. Other wavelengths are blocked by the filter.

### SPECIFICATIONS

MODEL	UG11-UV
Spectral range	250 nm - 370 nm
Diameter	25 mm $\varnothing$
Clear aperture	80% of area
Dimensional tolerance	+0.0 / -0.2 mm
Thickness	3 mm
Thickness tolerance	+0.0 / -0.2 mm
Parallelism	< 3 arcmin
Surface flatness	< $\lambda/4$
Maximum power	1 W
Surface quality	40 - 20 Scratch-Dig
Damage threshold	30 W/cm <sup>2</sup> (typical)
Product page	

\* Data specified at 633 nm


### SPECTRAL TRANSMISSION



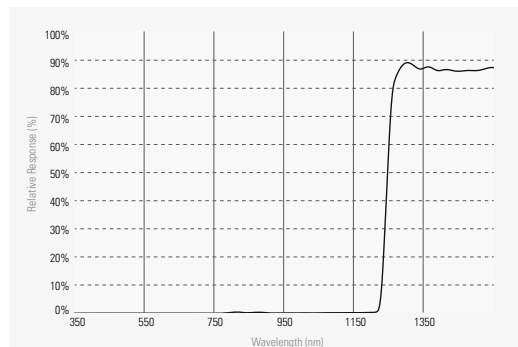
## IR FILTER

The B3-IR-FILTER is a color glass filter specifically designed for IR applications. Acting as a longpass filter, the B3-IR-FILTER cuts all the wavelengths below 1250 nm and only lets the IR wavelengths pass. It transmits approximately 70 % of the incident light.

### SPECIFICATIONS

MODEL	B3-IR-FILTER
Spectral range	1250 - 1350 nm
Diameter	25 mm $\varnothing$
Clear aperture	80% of area
Dimensional tolerance	+0.0/-0.2 mm
Thickness	6.3 mm max
Parallelism	< 3 arcmin
Surface flatness	< $\lambda/4$
Maximum power	1 W
Surface quality	80-50 Scratch-Dig
Damage threshold	30 W/cm <sup>2</sup> (Typical)
Product page	

### SPECTRAL TRANSMISSION





**CL**  
Beam size management



**CAMERA LENSES**

Camera lenses work by indirectly imaging on the sensor the reflection or the transmission of a beam that previously went through a diffusing material such as glass (see diagrams below).

It is necessary to use a camera lens to image beams that are larger than the CMOS sensor (11.3 mm X 11.3 mm) of the Beamage beam profiling camera. A camera lens can be directly C-mounted onto the aperture of the Beamage camera.

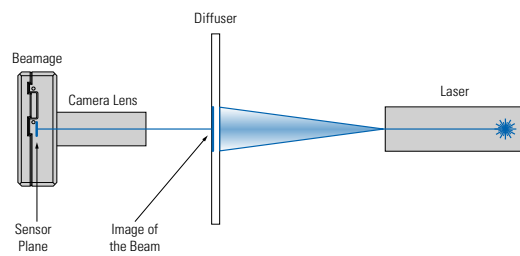


**SPECIFICATIONS**

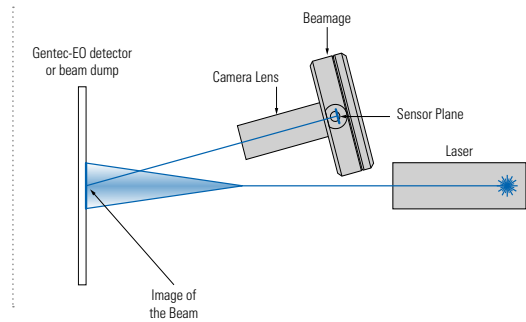
	CL-25	CL-50
<b>Focal length</b>	25 mm	50 mm
<b>Horizontal FOV</b>	14°	7°
<b>FOV at 1m</b>	245 mm	120 mm
<b>Minimum working distance</b>	0.5 m	1 m
<b>Maximum beam size</b>	2000 mm X 2000 mm (not a limiting factor)	2000 mm X 2000 mm (not a limiting factor)
<b>Maximum measurable intensity / energy</b>	Very high because of indirect mechanism	Very high because of indirect mechanism
<b>Inverted image</b>	Yes	Yes
<b>Beam distortion</b>	Setup, lens aberration and speckles from diffusing glass	Setup, lens aberration and speckles from diffusing glass
<b>Diffusing material needed</b>	Yes	Yes
<b>Magnification calibration needed</b>	Yes	Yes
<b>Possibility of wavelength conversion</b>	Yes	Yes
<b>Optical filter needed</b>	Rarely to never	Rarely to never
<b>Removable</b>	Yes	Yes



**IMAGING A TRANSMITTED BEAM**



**IMAGING A REFLECTED BEAM**



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