WAVELENGTH MANAGEMENT

UV CONVERTERS

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

MODEL		BSF23C23N	BSF23P23N	BSF23R23N	BSF23G23N
Input Aperture Ø		23 mm			
Closest Standard Optical Camera Format		2/3"			
Main Tube Length (L)		76.3 mm			
Extension Tube Length (D)		30 mm			
Overall Length (OAL)		124.8 mm			
Max Input Beam Size		12.5 x 18.4 mm			
Max Beam Size on CMOS		6.0 x 8.8 mm			
Magnification		2.1			
Crystal Type		C	P	R	G
Wavelength Range		110 - 225 nm	110 - 350 nm	110 - 535 nm	X-ray - 400 nm
Relative Response	193 nm	22	48	100	480
	248 nm	0.17	15	8	480
	308 nm	0.03	1	0.18	112
Saturation Level	193 nm	400 mJ/cm^2	30 mJ/cm^2	50 mJ/cm^2	10 mJ/cm^2
	248 nm	N/A	30 mJ/cm^2	400 mJ/cm^2	10 mJ/cm^2
	308 nm	N/A	50 mJ/cm^2	400 mJ/cm^2	50 mJ/cm^2
Decay Time		3 - 5 µs	5 µs	3000 µs	0.5 µs
Max Repetition Rate		30 - 20 kHz	20 kHz	30 Hz	200 kHz
Product Number		202325	202329	202331	202327

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**.

WAVELENGTH MANAGEMENT

IR ADAPTOR

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).

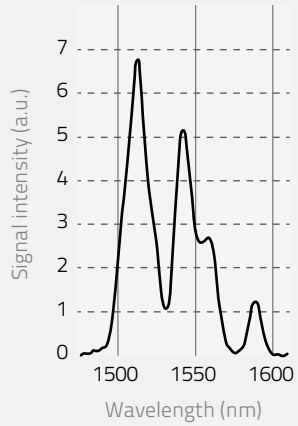
MAIN CHARACTERISTICS

- 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

MODEL	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 ^1.41
Spectral Transmission	360 nm – 2000 nm @ F30.8
Damage Threshold	1 W/cm^2
Dimensions	46 mm Ø x 97 mm L
Operating Temperature	-10°C to +40°C
Weight	210 g
Product Number	201061

EXCITATION SPECTRUM



** The Beamage-3.0 is also offered with an optional phosphor coated CMOS sensor (Beamage-3.0-IR), which is sensitive to wavelengths between 1495 nm and 1595 nm. See page 179 for more details.*

WAVELENGTH MANAGEMENT

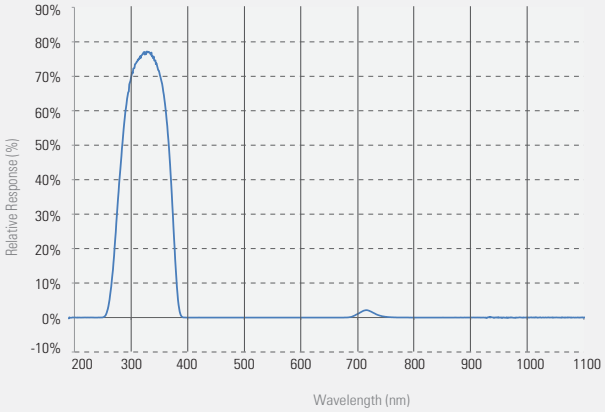
UV BANDPASS FILTER

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. The UG11-UV is SM1 threaded and comes with a SM1 to C-mount adaptor.

MODEL	UG11-UV
Spectral Range	250 nm – 370 nm
Diameter	25 mm Ø
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	< λ/4
Maximum Power	1 W
Surface Quality	40-20 Scratch-Dig
Damage Threshold	30 W/cm² (typical)
Product Number	202602

** Data specified at 633 nm*

SPECTRAL TRANSMISSION

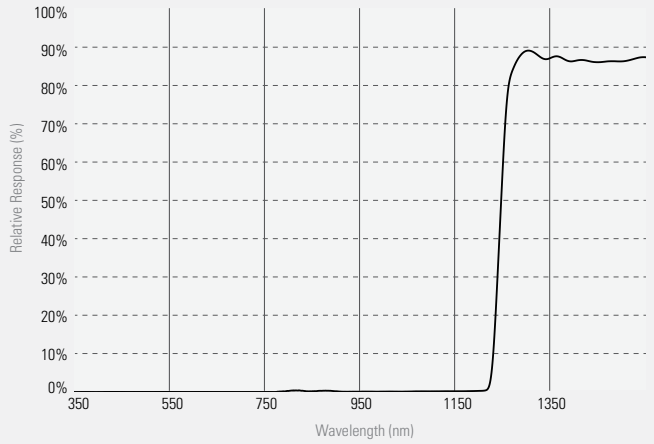


IR FILTER

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. The B3-IR-FILTER is SM1 threaded and comes with a SM1 to C-mount adaptor so you can mount it on the Beamage camera.

MODEL	B3-IR-FILTER
Spectral Range	1250 – 1350 nm
Diameter	25 mm Ø
Clear Aperture	80% of area
Dimensional Tolerance	+0.0/-0.2 mm
Thickness	6.3 mm max
Parallelism	< 3 arcmin
Surface Flatness	< λ/4
Maximum Power	1 W
Surface Quality	80-50 Scratch-Dig
Damage Threshold	30 W/cm² (Typical)
Product Number	202855

SPECTRAL TRANSMISSION



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 6.0 mm) of the Beamage beam profiling camera.

A Camera Lens can be directly C-mounted onto the aperture of the Beamage camera.

SPECIFICATIONS

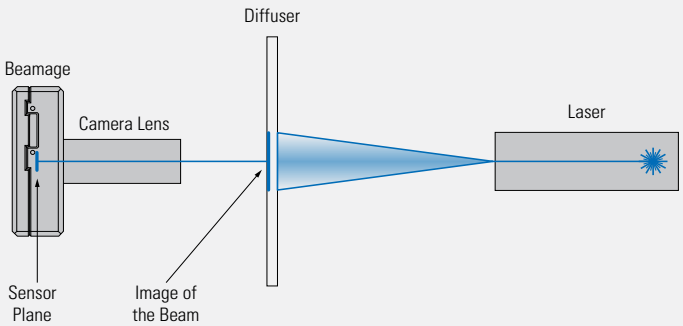
MODEL	CL-25	CL-50
Focal Length	25 mm	50 mm
Maximum Beam Size	2000 mm X 2000 mm (not a limiting factor)	2000 mm X 2000 mm (not a limiting factor)
Maximum Measurable Intensity / Energy	Very high because of indirect mechanism	Very high because of indirect mechanism
Inverted Image	Yes	Yes
Beam Distortion	Setup, lens aberration and speckles from diffusing glass	Setup, lens aberration and speckles from diffusing glass
Diffusing Material Needed	Yes	Yes
Magnification Calibration Needed	Yes	Yes
Possibility of Wavelength Conversion	Yes	Yes
Optical Filter Needed	Rarely to never	Rarely to never
Removable	Yes	Yes
Product Number	202343	202344

To determine which lens better fits your requirements, refer to the table below.

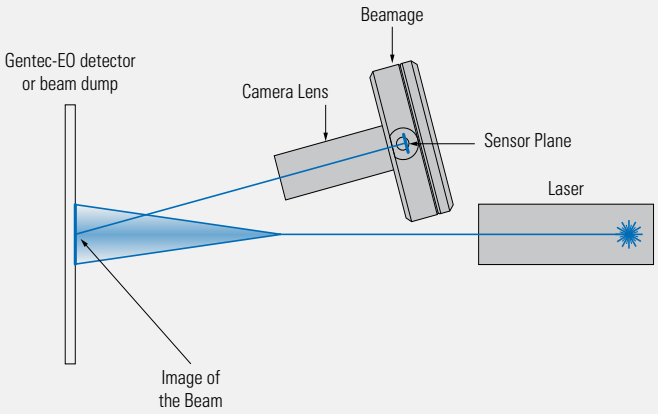
PRODUCT	PRODUCT NUMBER	FOCAL LENGTH	HORIZONTAL FOV	FOV AT 1 m	MINIMUM WORKING DISTANCE
CL-25	202343	25 mm	14°	245 mm	0.5 m
CL-50	202344	50 mm	7 °	120 mm	1 m

To calculate linear FOV (Field of View) at distances other than 1 m, simply multiply the value found in the table by the distance in meters.

IMAGING A TRANSMITTED BEAM



IMAGING A REFLECTED BEAM



POWER MANAGEMENT

NEUTRAL DENSITY (ND) FILTERS - UP TO 1 W

We offer various SM1 threaded absorptive ND (Neutral Density) 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. Subsequent filters can be stacked directly on each other. These filters reduce the intensity of all wavelengths without affecting the wavefront of the beam or distorting the image. Sets of 3 filters or 6 filters as well as individual filters are available. An empty SM1 threaded filter holder is also available for those who would like to use their own ND filters with their camera. It holds 25 mm wide filters.

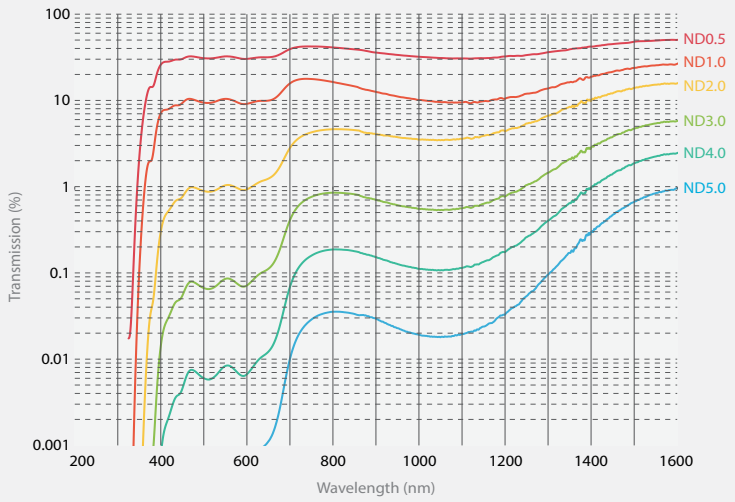
Each 25 mm filter and each holder comes with a SM1 to C-mount adaptor and each 50 mm filter comes with a SM2 to T-Mount adaptor.

MAIN SPECIFICATIONS

MODEL	ND0.5 TO ND5.0
Spectral Range	400 nm[a] - 1595 nm
Filter Diameter	25 mm Ø
Clear Aperture	22.5 mm Ø (90% of diameter)
Dimensional Tolerance	+0.0/-0.25 mm
Optical Density Tolerance	±5%
Parallelism	< 10 arcsec
Transmitted Wavefront Error	< λ/10 at 633 nm
Surface Flatness	< λ/4
Surface Quality	40-20 Scratch-Dig
Maximum Power	1 W
Damage Thresholds	100 W/cm² or 3 J/cm²

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

SPECTRAL TRANSMISSION OF ALL FILTERS



OVERVIEW OF THE MODELS

25 MM FILTERS		50 MM FILTERS		EQUIVALENT ATTENUATION	TRANSMITTANCE @ 633NM	SUBSTRATE
MODEL	(P/N)	MODEL	(P/N)			
ND0.5	201094	ND0.5-FOCUS	203403	(1/3,16)	~32%	NG4
ND1.0	201045	ND1.0-FOCUS	203404	(1/10)	~10%	NG4
ND2.0	201046	ND2.0-FOCUS	203405	(1/100)	~1%	NG9
ND3.0	201047	ND3.0-FOCUS	203406	(1/1000)	~0.1%	NG9
ND4.0	202600	ND4.0-FOCUS	203407	(1/10 000)	~0.01%	NG9
ND5.0	202601	ND5.0-FOCUS	203408	(1/100 000)	~0.001%	NG9
"NDSET-6 (Set of all 6 filters)"	202605	-		See Above	See Above	See Above
"NDSET-3 (Set of 3 filters (ND1, ND2, ND3))"	202606	-		See Above	See Above	See Above
"ND-H (ND filter holder)"	202607	-				

POWER MANAGEMENT

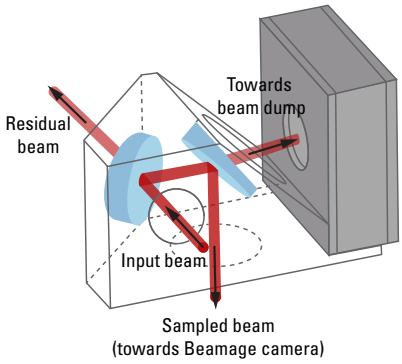
OPTICAL ATTENUATORS - UP TO 500 W

* Beam profiling camera and stand sold separately, adaptor tube for Beam profiling camera is included

	BA16-60S	BA16K-150S-H5-D0	BA16K-500F-H9-D0
MAXIMUM POWER	60 W	150 W	500 W
EFFECTIVE APERTURE	16 mm Ø	16 mm Ø	16 mm Ø
COOLING METHOD	Convection	Convection	Fan
MEASUREMENT CAPABILITY			
Spectral Range	200 nm - 2100 nm	200 nm - 2100 nm	200 nm - 2100 nm
Integrated Power Meter	None	UP19K-15S-H5-D0	UP19K-110F-H9-D0
Fan Input Voltage	N/A	N/A	12 VDC
Average Attenuation	1700 @ 1064 nm	1700 @ 1064 nm	1700 @ 1064 nm
Maximum Beam Diameter	16 mm Ø	16 mm Ø	16 mm Ø
Optical Wedges Material	UV Fused Silica (uncoated)	UV Fused Silica (uncoated)	UV Fused Silica (uncoated)
Sampled Beam Lateral Shift	21 mm	21 mm	21 mm
Sampled Beam Deviation	90°	90°	90°
Residual Beam Deviation	4°	4°	4°
Polarization correction	Yes (pair of orthogonal wedges)	Yes (pair of orthogonal wedges)	Yes (pair of orthogonal wedges)
PHYSICAL CHARACTERISTICS			
Aperture Diameter	16 mm Ø	16 mm Ø	16 mm Ø
Dimensions	45H x 47W x 81L mm	54H x 50W x 86L mm	54H x 54H x 126L mm
Weight	0.26 kg	0.37 kg	0.46 kg
ORDERING INFORMATION			
Product Name	BA16-60S	BA16K-150S-H5-D0	BA16K-500F-H9-D0
Product Number (without stand)	203791	203792	203793
Add Extension for INTEGRA (USB)	N/A	-INT	-INT
Add Extension for INTEGRA (RS-232)	N/A	-IDR	-IDR
Add Extension for BLU	N/A	-BLU	-BLU

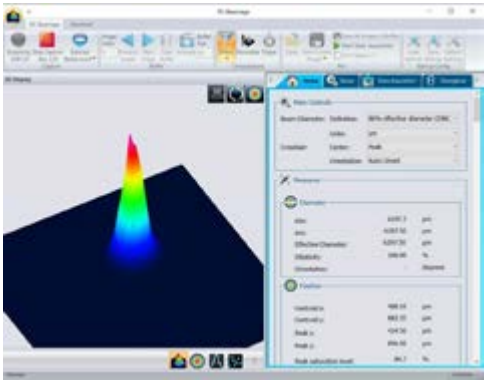
Specifications are subject to change without notice

POWER MANAGEMENT



PRESERVES POLARIZATION

The BA Series Optical Attenuators use Fresnel reflection on two optical wedges to pick off a small percentage of the input beam. Since the wedges are oriented orthogonally, the S and P polarization states are switched when the reflected beam hits the second wedge, and the difference in reflectance between the two states cancels out. The incoming beam polarization state and irradiance are thus preserved. The wavefront distortion is negligible and the laser output power stability is not affected.



MONITOR POWER AND PROFILE SIMULTANEOUSLY

The BA16K models include a calibrated thermal power detector that also acts as a beam dump. Simply plug the detector into a Gentec-EO Power Meter to measure and display relative power in real time.

To obtain an absolute measurement of power, you will have to determine a correction factor for the BA16K. This can be accomplished in few simple steps. Note, however, that such a correction factor is dependent on the laser polarization and will only be valid if the polarization is stable over time.

In the near future, a power measurement feature will be added to the PC-Beamage software which will then be able to display the laser power density (i.e. W / cm^2).

MODULAR CONCEPT

The "Sampled beam" port can be connected to the Beamage via the included adaptor tube. The adaptor tube is also compatible with our ND filters for additional attenuation (recommended for small beams at high power). An ND4 filter is always included with the purchase of a Beamage profiling camera.

The BA Series Optical Attenuators can also be used, stand-alone, as follows:

- OPTICAL PICK-OFF FOR USE WITH OUR ENERGY OR POWER DETECTORS
- ATTENUATOR FOR OUR HIGH SENSITIVITY DETECTORS LIKE M6, PH, ETC.
- POLARIZATION INSENSITIVE BEAM-SPLITTER WITH NO BACK REFLECTIONS

SEE ALSO

ACCESSORIES FOR BEAM DIAGNOSTICS 188
LIST OF REGULAR ACCESSORIES 198

APPLICATION NOTE
HOW TO CHOOSE A UV CONVERTER 202182
PROFILING AN IR LASER 202190

Watch the Introduction video available on our website at www.gentec-eo.com