

Optical Systems

Variable wheel attenuators

Laser power attenuators

Beam expanders

Iris diaphragms

F-Theta lenses

Beam dumps





EKSMA Optics is a manufacturer of precision laser components, used in high power lasers, laser systems and various other photonic devices and optical instruments. Rooted in laser community and with more than 40 years of experience in lasers and photonic components EKSMA Optics is your partner for enabling photonics innovations, offering fast delivery components tailored to customer applications.

This optical components catalog contains products dedicated to lasers and laser systems manufacturers, integrators, innovators, and scientists. The standard catalog components are available for fast off-the-shelf delivery. We also develop and customize our optical components tailoring the parameters of the particular laser and its applications.

All components provided by EKSMA Optics are subject to performance and quality testing and certification in Quality Control laboratory. Through stringent inspection procedures, quality control assessments and commitment to new advanced technologies, we are continuously improving and delivering exceptional quality. EKSMA Optics is an ISO 9001:2015 & ISO 14001:2015 certified company.

Your Partner in Photonics Innovations!



Establishment of a department for **optical systems assembling**.

2022



Opening and moving to new 7300 square meters EKSMA Optics **building** in Vilnius.

2021



Establishment of a CNC-based **spherical and aspherical** lens production. Commenced production of **pulse picking systems**.

2015



Establishment of a department **dielectric coatings deposition on laser optics and crystals**.

2014



Commenced production of **Pockels cells and Femtokits**.

2010



Investment into and expansion of flat **optics production** and **nonlinear crystals polishing**.

2007



Establishment of EKSMA's daughter company, **EKSMA Optics**, for laser optics business activities.

2006



State-owned company privatization and **EKSMA UAB** joint-stock company establishment.

1992



First-time participation at Munich Laser Fair. **EKSMA shows picosecond Nd:YAG laser**.

1987



Establishment of experimental optics and opto-mechanics company **EKSMA**, a spin-off from the Physics Institute.

1983

Optical Systems

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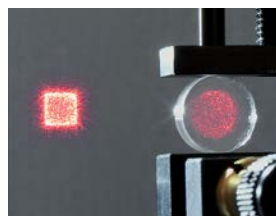
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Precision Spatial Filter
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Find more at EksmaOptics.com



Y-Z Positioner for lens, pinholes
and objectives **990-0100,**
990-0200
Find more at EksmaOptics.com



Y-Z Positioners for lens,
pinholes and objectives
990-0050, 990-0051
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Motorized Iris Diaphragms
995 Series
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Motorized Iris Diaphragms
997 Series
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Variable Wheel Attenuator
990-0604
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Closed Variable Wheel
Attenuator **990-0704**
Find more at EksmaOptics.com



Motorized Variable Two Wheels
Attenuators **991-0602**
Find more at EksmaOptics.com



Motorized Closed Variable
Two Wheels Attenuators
991-0702
Find more at EksmaOptics.com



Air-cooled Beam Dump
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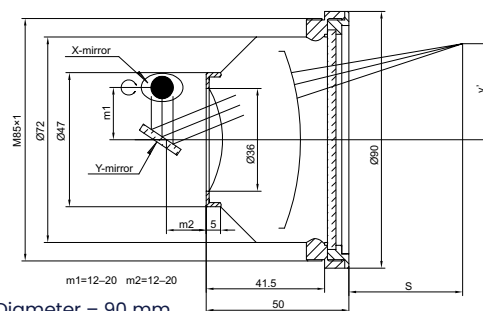


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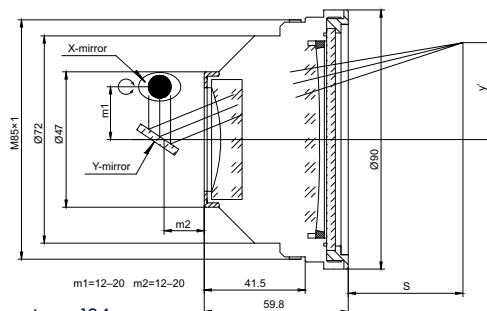
F-THETA LENS



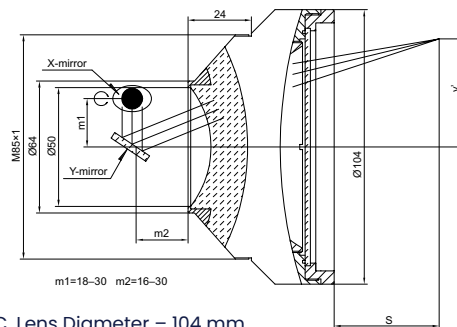
F-Theta lenses are designed to provide a flat field on the image plane for scanning and engraving applications where a high power laser and a set of rotating mirrors are used to scan across a given field.



A. Lens Diameter – 90 mm



B. Lens Diameter – 104 mm



C. Lens Diameter – 104 mm

BEST MIRROR PLACES m1/m2 – 16/16 mm, screw size – M85x1

Wavelength – 1064 nm, Lens Diameter – 90 mm

Focus length, mm	Working distance S, mm	Max. scan area, mm ²	Max. scan angle, θ max	Input beam diameter, mm	Spot size, μm	Drawing	Catalogue number	Price, EUR
100	114	70×70	±28°	12	16	A	150-1001	420
160	232	140×140	±28°	12	26	A	150-1601	420
210	287	145×145	±28°	12	34	A	150-2101	420
254	284	175×175	±28°	12	31	A	150-2541	420
290	355	200×200	±28°	12	31	A	150-2901	420
330	465	220×220	±28°	12	40	A	150-3301	420
420	467	300×300	±28°	12	50	A	150-4201	420

Wavelength – 532 nm, Lens Diameter – 90 mm

Focus length, mm	Working distance S, mm	Max. scan area, mm ²	Max. scan angle, θ max	Input beam diameter, mm	Spot size, μm	Drawing	Catalogue number	Price, EUR
100	114	70×70	±28°	12	16	A	150-1002	460
160	180	110×110	±28°	12	16	A	150-1602	460

Wavelength – 355 nm

Focus length, mm	Working distance S, mm	Max. scan area, mm ²	Max. scan angle, θ max	Input beam diameter, mm	Spot size, μm	Drawing	Catalogue number	Price, EUR
100	136	70×70	±25°	7	10	B	150-1003D1	930
160	186	110×110	±25°	7	15	B	150-1603	930

BEST MIRROR PLACES m1/m2 – 24/24 mm, screw size – M85x1

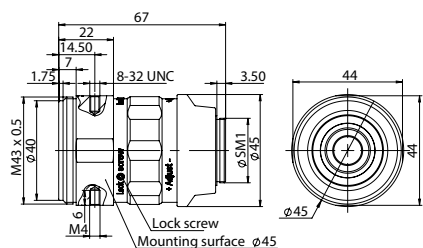
Wavelength – 1064 nm, Lens Diameter – 104 mm

Focus length, mm	Working distance S, mm	Max. scan area, mm ²	Max. scan angle, θ max	Input beam diameter, mm	Spot size, μm	Drawing	Catalogue number	Price, EUR
163	185	110×110	±28°	20	17	C	151-1631	520
210	255	150×150	±28°	20	24	C	151-2101	520
254	285	175×175	±28°	20	31	C	151-2541	520
420	467	300×300	±28°	20	55	C	151-4201	520
650	697	400×400	±25°	20	85	C	151-6501	520

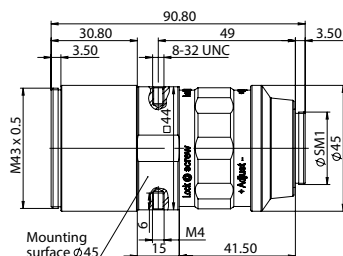
FIXED RATIO BEAM EXPANDERS FOR HIGH POWER LASERS

Features

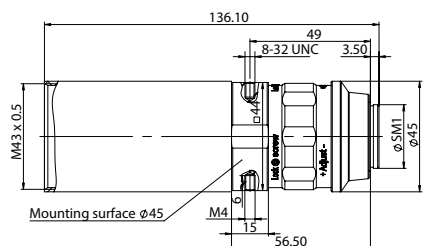
- Designed for high power laser applications:
 - IBS-coated UV FS thin lenses
 - High total transmission: > 99%
 - Low GDD: relative pulse broadening < 20%
- AR-coated for: 1030 nm, 515 nm, 355 nm
- Fixed magnifications from 1.5X to 10X
- Divergence adjustment: non-rotating optics, sliding lens design



Model for 1.5X and 2X expanders



Model for 3X and 5X expanders



Model for 7.5X and 10X expanders

EKSMA Optics offers Galilean type beam expanders with thin UV FS lenses suitable for femtosecond applications. Fixed Ratio Beam Expanders are designed to increase the diameter of a collimated input high power laser beam to a larger collimated output

beam. Fixed Ratio Beam Expanders can be adjusted for the input beam divergence angle to obtain collimated, divergent or focused beam at the output. They feature non-rotating divergence adjustment by sliding lens design.

Specifications

Transmitted Wavefront Distortion (TWD)	$\lambda/6$ at 633nm	
Focus Range	1.7	
Laser Damage Threshold	1064 nm 532 nm 355 nm	>10 J/cm ² , 10 ns pulse, 10 Hz >7 J/cm ² , 10 ns pulse, 10 Hz >5 J/cm ² , 10 ns pulse, 10 Hz
Input Thread	SM1 external	
Output Thread	M43×0.5 external	
Mounting Options	M43×0.5, SM1, M27, M4, 8-32 UNC	

Designed for 1030 nm, coating R<0.1% @ 1000 – 1080 nm

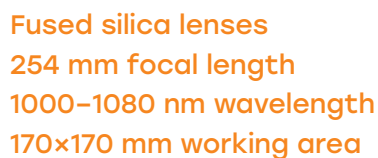
Expansion ratio	Input clear aperture, mm	Output clear aperture, mm	Diffraction limited input beam diameter, mm	Focus range, m	GDD @ 1030 nm, fs ²	Catalogue number	Price, EUR
1.5X	11.0	22.8	11.0	4 – ∞	66	161-1.5X-1H	450
2X	11.0	22.8	9.0	2 – ∞	76	161-2X-1H	450
3X	11.0	34.5	9.0	2.5 – ∞	114	161-3X-1H	550
5X	10.0	34.5	4.5	1.7 – ∞	123	161-5X-1H	550
7.5X	8.0	36.0	3.5	3.5 – ∞	152	161-7.5X-1H	670
10X	8.0	36.0	3.0	3.2 – ∞	152	161-10X-1H	670

Designed for 515 nm, coating R<0.1% @ 500 – 535 nm

Expansion ratio	Input clear aperture, mm	Output clear aperture, mm	Diffraction limited input beam diameter, mm	Focus range, m	GDD @ 515 nm, fs ²	Catalogue number	Price, EUR
1.5X	11.0	22.8	11.0	4 – ∞	240	161-1.5X-2H	450
2X	11.0	22.8	9.0	2 – ∞	275	161-2X-2H	450
3X	11.0	34.5	9.0	2.5 – ∞	412	161-3X-2H	550
5X	10.0	34.5	4.5	1.7 – ∞	447	161-5X-2H	550
7.5X	8.0	36.0	3.5	3.5 – ∞	550	161-7.5X-2H	670
10X	8.0	36.0	3.0	3.2 – ∞	550	161-10X-2H	670

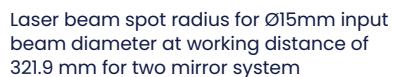
Designed for 343 nm, coating R<0.2% @ 340 – 355 nm

Expansion ratio	Input clear aperture, mm	Output clear aperture, mm	Diffraction limited input beam diameter, mm	Focus range, m	GDD @ 343nm, fs ²	Catalogue number	Price, EUR
1.5X	11.0	22.8	11.0	4 – ∞	432	161-1.5X-3H	530
2X	11.0	22.8	9.0	2 – ∞	495	161-2X-3H	530
3X	11.0	34.5	9.0	2.5 – ∞	741	161-3X-3H	630
5X	10.0	34.5	4.5	1.7 – ∞	803	161-5X-3H	630
7.5X	8.0	36.0	3.5	3.5 – ∞	988	161-7.5X-3H	750
10X	8.0	36.0	3.0	3.2 – ∞	988	161-10X-3H	750



Specifications

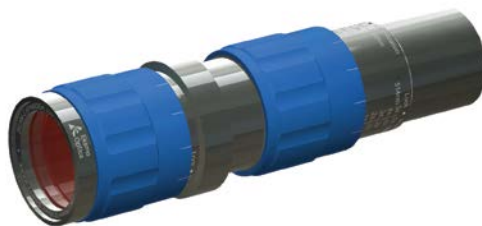
Lens material	UVFS
Effective focal length	254 mm
Design wavelength	1030 nm
Wavelength range	1000 – 1080 nm
Scan length (one mirror system)	246.4 mm
Scan area (two mirror system)	170 × 170 mm
Working distance	321.9 mm
Maximum entrance beam diameter	15 mm
Optical scan angle	±28 °
Aperture stop distance	28.1 mm
Distance from the mount to M1 and M2	20.6 mm and 35.6 mm
Maximum telecentricity error	12 °
F-Theta distortion (max)	0.87%
Number of elements	4 lenses + protective window
Total transmission	>97%
Coating LIDT	CW @ 1070 nm: >10 MW/cm ² fs @ 1030 nm (200 fs, 1 kHz): >0.5 J/cm ² ns @ 1064 nm (10 ns, 100 Hz): >30 J/cm ²
AR coating	AR<0.2% @(1000–1080) nm, i(0–35) °
GDD specification	1295 fs ²
Maximum lens housing diameter	Ø154 mm
Easily replaceable protective window (UVFS)	Ø144 × 3 mm
Mounting threads	M85 × 1
Weight	1155 g



ZOOM BEAM EXPANDERS

Features

- Designed for high power laser applications:
 - IBS-coated UVFS thin lenses
 - LDT > 80 J/cm² at 10 ns, 100 Hz, 1064 nm and > 0.5 J/cm² at 200 fs, 1 kHz, 1030 nm
 - High total transmission: > 98.5%
 - Low GDD: relative pulse broadening < 21% at 1030 nm
- Dual band AR-coated for: 1030/1064 nm + 515/532 nm
- Diffraction limited design for continuous magnification from 1X to 5X
- Divergence adjustable design: non-rotating optics, sliding lens design
- No back reflection focusing outside
- Cannot be used as beam reducer



Designed for
515-532 + 1030-1064 nm
Magnification 1x-5x
Sliding lens design

Specifications

Magnification	1x - 5x				
Wavelength	515-532 + 1030-1064 nm				
Diffraction-limited input beam diameter (by design)	1x	2x	3x	4x	5x
@ 515-532 nm	9 mm	11 mm	10 mm	9 mm	7 mm
@ 1030-1064 nm	10 mm	11 mm	11 mm	9 mm	7 mm
Output beam diameter	9 mm (1x) - 35 mm (5x)				
Input clear aperture diameter	11 mm				
Output clear aperture diameter	36 mm				
Total lens thickness	8.75 mm				
Pulse dispersion	515 nm		1030 nm		
GVD	601 fs²		166 fs²		
Input impulse duration	26 fs				
Output impulse duration	69.2 fs		31.5 fs		
Relative pulse broadening	266%		21%		
Wavefront distortion @ 633 nm	λ/4				
AR coating, single surface	AR<0.2% @ 505-535 + 1000-1070nm + AR<5% @ 633nm, AOI 0-8 deg AR<0.5% @ 505-535 + 1000-1070nm + AR<5% @ 633nm, AOI 9-20 deg				
Typical transmission	> 98.5%				
Beam pointing stability	< 0.5 mrad				
Coating LIDT	> 0.5 J/cm2 @ 1030 nm, 200 fs, 1 kHz > 80 J/cm2 @ 1064 nm, 10 ns, 100 Hz				
Reverse usage	No				

Mounting

Input thread	SMI external
Mounting options	SMI external, $\varnothing 38.1$ mm, $\varnothing 50.8$ mm, M4

Mounting suggestions

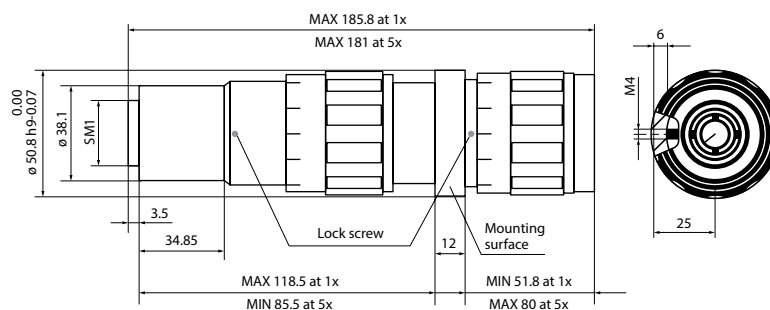


Mounting in 5-axis kinematic holder



Mounting on M6 thread

Catalogue number	Design wavelength, nm	Expansion	Input aperture, mm	Output aperture, mm	Weight, kg	Price, EUR
166-1X5X-1H2H	515-532 + 1030-1064	1X-5X	11.0	36.0	0.41	2100
166-1X5X-3H	343-355	1X-5X	11.0	36.0	0.41	2200



Technical drawing of 166-1X5X-1H2H

COMPACT BEAM EXPANDER



A laser beam expander is designed to increase the diameter of a collimated input beam to a larger collimated output beam. EKSMA OPTICS offers compact Galilean type beam expanders for 1064 nm, 532 nm

and 355 nm wavelengths. Compact beam expander has the possibility to be adjusted for the input beam divergence angle to obtain collimated, divergent or focused beam at the output.

Specifications

Lens material	AR coated Fused Silica Lenses
Screw size	M22×0.75

Wavelength, nm	Expansion ratio	Beam expander size L, mm	Transmission, %	Catalogue number	Price, EUR
1064	2X	51	>96	160-0021	235
1064	2.5X	51	>96	160-0251	235
1064	3X	68	>96	160-0031	235
1064	4X	75	>96	160-0041	235
1064	5X	73	>96	160-0051	235
1064	6X	75	>96	160-0061	235
1064	8X	77	>96	160-0081	235
1064	10X	70	>96	160-0101	235
532	2X	51	>96	160-0022	235
532	2.5X	51	>96	160-0252	235
532	3X	68	>96	160-0032	235
532	4X	75	>96	160-0042	235
532	5X	73	>96	160-0052	235
532	6X	75	>96	160-0062	235
532	8X	77	>96	160-0082	235
532	10X	70	>96	160-0102	235
355	4X	75	>96	160-0043	250
355	6X	75	>96	160-0063	250
355	8X	68	>96	160-0083	250
355	10X	71	>96	160-0103	250

Compact beam expanders of other expansion ratio are available upon request.

Related Product

Large Rod Small Mounting Clamp (aluminium) 810-0062A

Find more at EksmaOptics.com



ZOOM BEAM EXPANDER

Features

- Adjustable 1X – 8X or 2X – 8X expansion ratio
- Adjustable divergence
- Galilean design



Compact Galilean type zoom beam expanders are designed for Nd:YAG fundamental and harmonic wavelengths: 1064 nm, 532 nm and

355 nm. Zoom beam expanders provide 1X – 8X or 2X – 8X continuous magnification with adjustable focus to correct for laser beam divergence.

Wavelength, nm	Expansion ratio	Input Clear Aperture, mm	Output Clear Aperture, mm	Length, mm	Catalogue number	Price, EUR
1064	1x-8x	12	33	162	165-1181	860
1064	2x-8x	12	33	143.3	165-1281	860
532	1x-8x	12	33	162	165-1185	860
532	2x-8x	12	33	139.9	165-1285	860
355	1x-8x	12	33	162	165-1183	1120
355	2x-8x	12	33	158.5	165-1283	860

Related Product

Universal Adjustable Optics Mount 830-0035

Find more at EksmaOptics.com



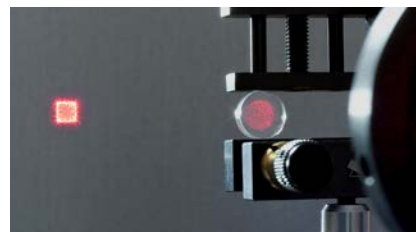
Visit our e-shop www.eksmaoptics.com and find the drawings of all zoom beam expanders.

TOP HAT BEAM SHAPING LENSES – FBS

Features

- Transforms Gaussian beams into flat-top beams
- Different shapes of Top Hat spots – round, square, line
- Easy to integrate into existing beam paths

FBS Series beam shapers are designed to transform collimated Gaussian beams into small and homogeneous Top Hat spots of square, round or line shapes. FBS beam shapers should be used in setup with focusing optics, and the working distance of a Top Hat beam shaper is determined by the focal length of the focusing optics.



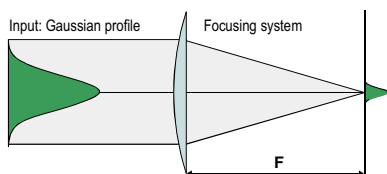
Specifications

Material	UV Fused Silica
Transmission	>99%
Diameter	25.4 mm
Thickness	3 mm
Laser damage threshold	10 J/cm ² @ 1064 nm, 10 ns 5 J/cm ² @ 532 nm, 10 ns 3 J/cm ² @ 355 nm, 10 ns

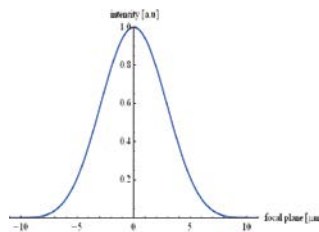
Operation Requirements

Input beam	Gaussian beam (TEM ₀₀), M ² < 1.4
Input beam diameter	Fixed, ±5% tolerance
Operation wavelength	Fixed
Optical setup	Clear apertures along beam path at least 2.2x larger than the beam size @ 1/e ²

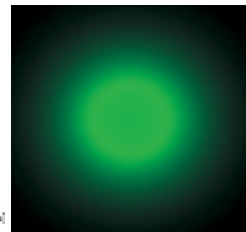
Without FBS Beam Shaper



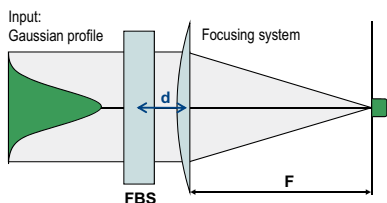
Gaussian-profile at focal plane



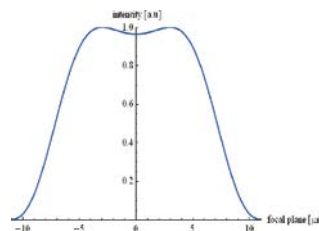
Diffraction limited Gaussian profile



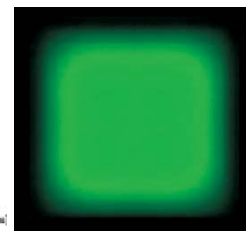
With FBS Beam Shaper



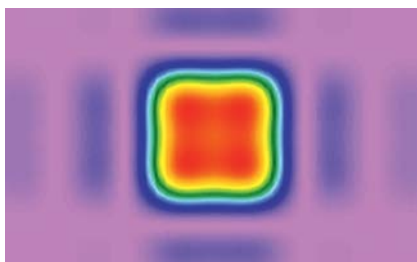
Top-Hat-profile at focal plane



Near diffraction limited Top Hat profile



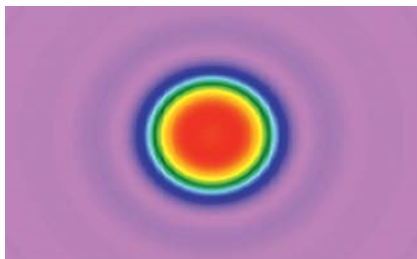
FBS2 – Square Top Hat Profile



Spot Geometry

Top Hat width	approximately $2 \times \lambda \times (f/d)$, with f = focal length, d = beam diameter @ $1/e^2$
Efficiency	up to 90%
Homogeneity	ca. $\pm 2.5\%$ (rel. to average intensity of the Top Hat plateau)
Side modes (strongest)	~16.5x weaker than line plateau ($< 1.5\%$ of input energy)
Depth of focus (DOF)	~60% of the Rayleigh length

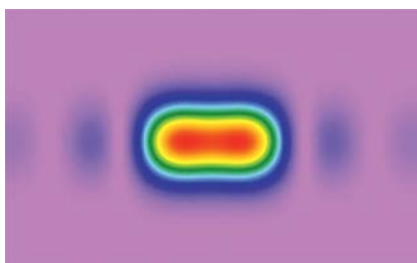
FBSR – Round Top Hat Profile



Spot Geometry

Top Hat diameter	approximately $2 \times \lambda \times (f/d)$, with f = focal length, d = beam diameter @ $1/e^2$
Efficiency	up to 95%
Homogeneity	ca. $\pm 2.5\%$ (rel. to average intensity of the Top Hat plateau)
Side modes (strongest)	~70x weaker than line plateau ($< 1.5\%$ of input energy)
Depth of focus (DOF)	~30% of the Rayleigh length

FBSL – Line Top Hat Profile



Spot Geometry

Line length (Top Hat)	approximately $2 \times \lambda \times (f/d)$, with f = focal length, d = beam diameter @ $1/e^2$
Line width (Gaussian)	Similar to the diameter of Gaussian spot in the same optical configuration
Efficiency	up to 92.5%
Homogeneity	ca. $\pm 2.5\%$ (rel. to average intensity of the Top Hat plateau)
Side modes (strongest)	~15x weaker than line plateau ($< 1.7\%$ of input energy)
Depth of focus (DOF)	~50% of the Rayleigh length

Ordering information

FBS2-1064-1.0

Model name:

- FBS2 – Square profile
- FBSR – Round profile
- FBSL – Line profile

Operation wavelength:

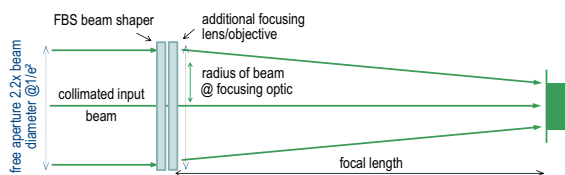
- 1064 nm
- 1030 nm
- 532 nm
- 515 nm
- 355 nm
- 343 nm

Input beam diameter (@ $1/e^2$):

- From 1.0 to 6.0 mm, increment: 0.5 mm

There are different possibilities to integrate the FBS beam shaper into an optical setup.

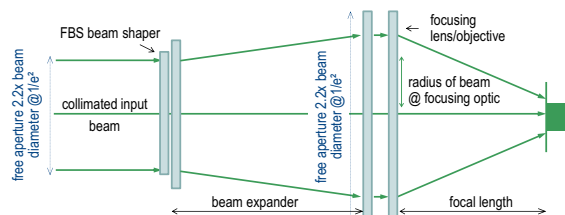
1. Beam shaper directly in front of a focusing optic/objective



By introducing the FBS beam shaper into the beam path in front of a lens/objective the initial diffraction limited Gaussian spot will be transformed into a homogeneous Top-Hat profile.

When a Gaussian TEM₀₀ input beam with a diameter of 5 mm @ 1/e² is used the diameter of the free aperture along the total beam path have to be at least 11 mm (better 13 mm). If for example a wavelength with 532 nm, a Gaussian TEM₀₀ input beam with a diameter of 5 mm @ 1/e² and a focusing lens with f=160 mm is used, one will get a homogeneous Top Hat profile with a diameter of 34 µm.

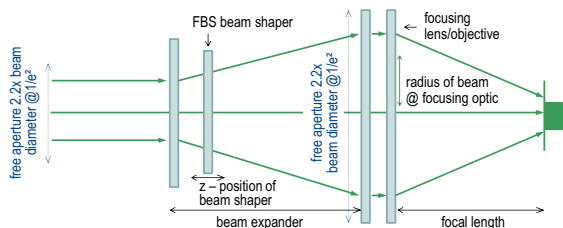
2. Beam shaper in front of a beam expander



There is also the possibility to introduce the FBS beam shaper into the beam path in front of a beam expander. This leads to a higher numerical aperture of the focused beam and to a smaller Top Hat profile.

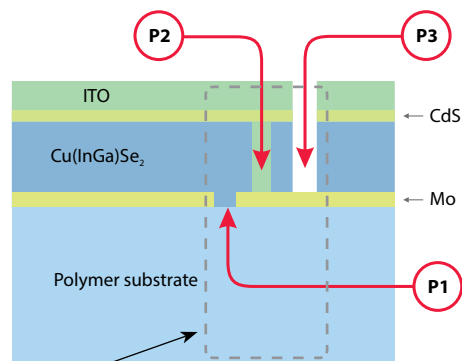
Example: A Gaussian beam with a diameter of 5 mm @ 1/e² illuminates the FBS beam shaper and is afterwards increased by a beam expander to a beam diameter of 8 mm. With an focusing optic with f=50 mm the user can generate a Top Hat with a diameter of 7 µm. The needed free aperture increases with the expanded beam. For a beam with a diameter of 8 mm the free aperture has to be at least 18 mm.

3. Beam shaper within a beam expander



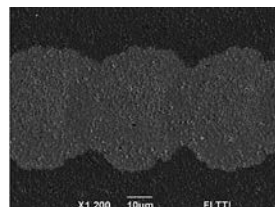
A further and even more flexible possibility is to introduce the FBS beam shaper into the beam path within a beam expander. The user has the possibility for an easy "fine tuning" of beam diameter at the position of FBS beam shaper by shifting shaper along z-axis.

Scribing of CIGS-solar cells

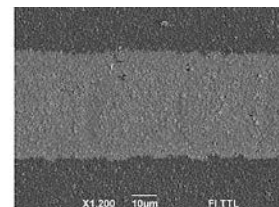


- Wasted area, reducing efficiency → need of smallest scribing lines
- Cut quality influence efficiency → need of small HAZ, no debris, smooth edges
- High scanning speed for high throughput → need of small pulse overlap

P1 – „Scribing“



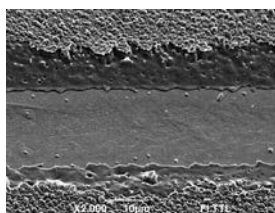
Gaussian Profile



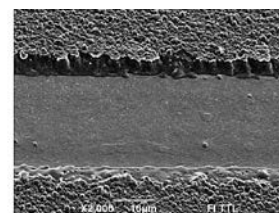
FBS-Top-Hat Profile
small overlap, smooth edges

Removal of a front contact in ZnO(1 µm)/CIGS/Mo/PI structure. Laser PL10100/SH, 10 ps, 370 mW, 100 kHz, 532 nm; scanning speed 4.3 m/s, single pass.

P3 – „Scribing“



Gaussian Profile



FBS-Top-Hat Profile
small HAZ, smooth edges

Tilted SEM pictures of the P3 scribe in ZnO(1 µm)/CIGS/ Mo/ PI structure. Laser PL10100/SH, 10 ps, 370 mW, 100 kHz, 532 nm; scanning speed 60 mm/s, single pass.

Raciukaitis et. al, JLMN-Vol. 6, No. 1, 2011

Recommended Accessories

Zoom Beam
Expander

See page 8



Two Axes Translation
Polarizer Holder
840-0240

Find more at
EksmaOptics.com



CONTINUOUSLY VARIABLE ATTENUATOR / BEAMSPLITTER 990-0060

Features

- Divides laser beam into two beams of manually adjustable intensity ratio
- Convenient 90° angle between reflected and transmitted beams
- Negligible beam deviation
- Large dynamic range
- Broadband transmission
- Weight – 0.16 kg



Continuously Variable Attenuator/ Beamsplitter is designed to be used for laser pulses as short as 100 fs. It consists of 2 high-performance

polarizing optics components placed in precision opto-mechanical holder 840-0197. Variable attenuator/ beamsplitter incorporates a high-performance Polarizing Cube Beamsplitter which reflects s-polarized light at 90° while transmitting p-polarized light.

A rotating $\lambda/2$ waveplate is placed in the incident polarized laser beam. The intensity ratio of those two beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit beam, and their intensity ratio, can be controlled over a wide dynamic range. Pure p-polarization could be selected for maximum transmission, or pure s-polarization for maximum attenuation of the transmitted beam.

ACHROMATIC AIR-SPACED WAVEPLATE AND HIGH POWER BROADBAND CUBE POLARIZING BEAMSPLITTER

Specifications

Extinction ratio	$T_s/T_p < 1:200$
Clear aperture	11 mm

for Broadband Region

Central wavelength, nm	LDT, J/cm ²	Catalogue number	Price, EUR
450-680	1 ¹⁾	990-0060-11VIS	1060
700-1000	2 ²⁾	990-0060-11IR	1060

¹⁾ LDT measured at 532 nm, 10 Hz, 10 ns pulses.

²⁾ LDT measured at 1064 nm, 10 Hz, 10 ns pulses.

MULTIPLE ORDER HALF WAVEPLATE AND HIGH POWER CUBE POLARIZING BEAMSPLITTER

Specifications

Extinction ratio	$T_s/T_p < 1:500$
Clear aperture	11 mm

Central wavelength, nm	LDT, J/cm ² ¹⁾	Catalogue number	Price, EUR
1064	15	990-0061-11	740
1030	15	990-0062-11	740
800	8	990-0063-11	740
532	6	990-0064-11	740
355	3	990-0065-11	770

¹⁾ LDT measured at designed wavelength, 10 Hz, 10 ns pulses.

VARIABLE ATTENUATORS FOR LINEARLY POLARIZED LASER BEAM 990-0070

Features

- Divides laser beam into two parallel beams of manually adjustable intensity ratio
- Large dynamic range
- Transmitted beam shift ~ 0.5 mm
- High optical damage threshold

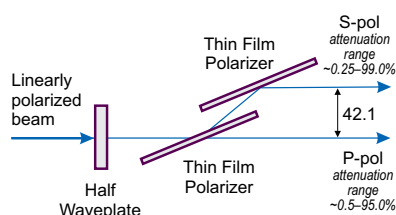


Note: Movable base **820-0090**, Rod Holder **820-0050-02** and standard rod should be ordered separately.

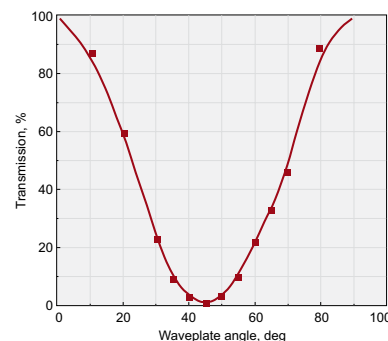
This variable attenuator/beamsplitter consists of special design opto-mechanical Adapter and precision opto-mechanical holder 840-0197.

Two Thin Film Brewster type polarizers, which reflects s-polarized light while transmitting p-polarized light, are housed into Adapter. Quartz Half Waveplates are housed in rotating holder 840-0197.

The intensity ratio of those two beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit



beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high-purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place. The holder 840-0197 allows to adjust angle of incidence of the Thin Film Brewster type polarizers by $\pm 2^\circ$ and to get the maximum polarization contrast.



For Nd:YAG Laser Applications

Aperture diameter	17 mm
Damage threshold	5 J/cm ² pulsed at 1064 nm, typical
Polarization Contrast (after 1st polarizer)	>1:200
Polarization Contrast (after 2nd polarizer)	>1:500
Weight	0.35 kg

For Nd:YAG Laser Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0070-266H *	1050
355	990-0070-355	780
532	990-0070-532	680
1064	990-0070-1064	680

Multi order half waveplate is housed in rotating holder 840-0197 for Nd:YAG laser pulses (laser damage threshold: 5 J/cm² pulsed at 1064 nm, typical).

* With Zero Order Air-Spaced half waveplate.

For Femtosecond Applications

Aperture diameter	17 mm
Damage threshold	>10 mJ/cm ² , 50 fs pulse at 800 nm, typical
for high power laser applications	>100 mJ/cm ² , 50 fs pulse at 800 nm, typical
Polarization contrast (after 1st polarizer)	>1:200
Polarization contrast (after 2nd polarizer)	>1:500
Weight	0.35 kg

For Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257	975
266	990-0070-266	975
343	990-0070-343	870
400	990-0070-400	770
390-410	990-0070-400B	920
515	990-0070-515	770
505-525	990-0070-515B	920
800	990-0070-800	770
780-820	990-0070-800B	920
1030	990-0070-1030	770
1010-1050	990-0070-1030B	920

Zero order optically contacted half waveplate is housed in rotating holder 840-0197 for femtosecond laser pulses (laser damage threshold: >10 mJ/cm², 50 fs pulse, 800 nm typical).

For High Power Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257H	1050
266	990-0070-266H	1050
343	990-0070-343H	945
400	990-0070-400H	845
390-410	990-0070-400HB	995
515	990-0070-515H	845
505-525	990-0070-515HB	995
800	990-0070-800H	845
780-820	990-0070-800HB	995
1030	990-0070-1030H	845
1010-1050	990-0070-1030HB	995

Zero Order Air-Spaced half waveplate is housed in rotating holder 840-0197 for high power femtosecond applications (laser damage threshold: >100 mJ/cm², 50 fs pulse, 800 nm typical).

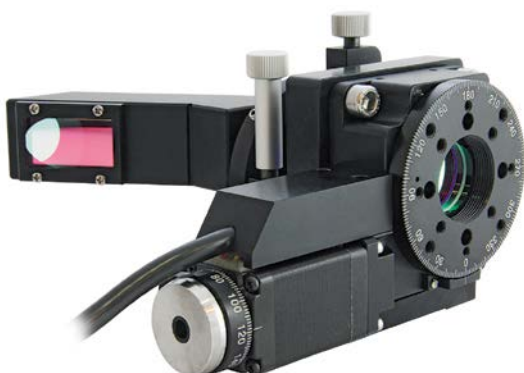
Related Products

Beam dumps
990-0800,
990-0820



See page 23

MOTORIZED VARIABLE ATTENUATOR FOR LINEARLY POLARIZED LASER BEAM 990-0070M



This motorized variable attenuator/beamsplitter consists of special design opto-mechanical Adapter and precision opto-mechanical holder 840-0193. Two Thin Film Brewster type polarizers, which reflects s-polarized light while transmitting p-polarized light, are housed into Adapter. Quartz Half Waveplates are housed in motorized rotation stage 960-0161.

The intensity ratio of those two beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high-purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place. The holder 840-0193 allows to adjust angle of incidence of the Thin Film Brewster type polarizers by $\pm 2^\circ$ and to get the maximum polarization contrast.

Ordering information

Please note: these motorized variable attenuators for linearly polarized laser beam are provided without controller and power supply. If you would like to order the complete solution (controller 980-1045 and power supply: PS12-1.5-4), please add CP to code and 695 EUR to price.

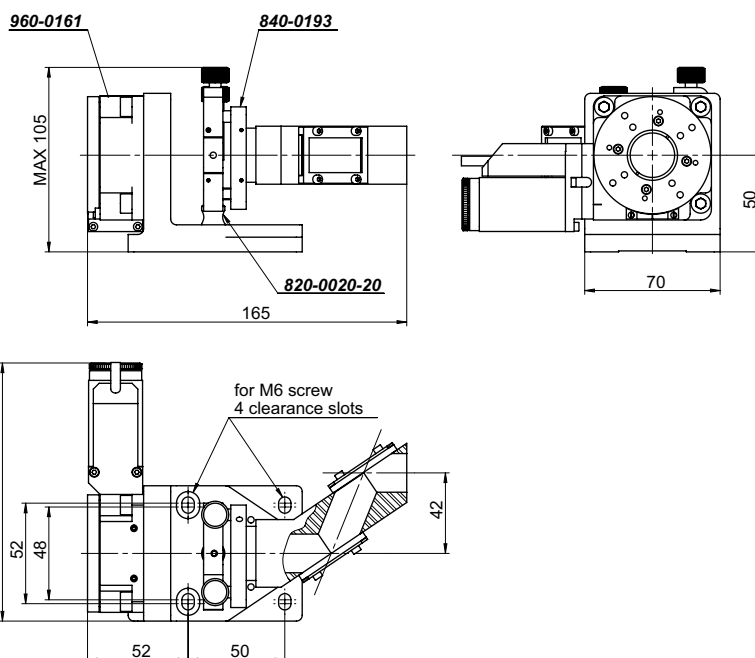
Example:

990-0070-266M – motorized attenuator without controller and power supply.

Price – 1830 EUR

990-0070-266M+CP – motorized attenuator with controller and power supply.

Price – 2525 EUR



For Nd:YAG Laser Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0070-266HM *	1830
355	990-0070-355M	1560
532	990-0070-532M	1460
1064	990-0070-1064M	1460

Multi order half waveplate is housed in Motorized Rotation Stage 960-0161 and Polarizer with adapter in Kinematic Optical Mount 840-0193 for Nd:YAG laser application (laser damage threshold: 5 J/cm², 10 ns pulses, 10 Hz at 1064 nm, typical).

* With Zero Order Air-Spaced half waveplate.

For Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257M	1755
266	990-0070-266M	1755
343	990-0070-343M	1650
400	990-0070-400M	1550
390-410	990-0070-400BM	1700
515	990-0070-515M	1550
505-525	990-0070-515BM	1700
800	990-0070-800M	1550
780-820	990-0070-800BM	1700
1030	990-0070-1030M	1550
1010-1050	990-0070-1030BM	1700

Zero order optically contacted half waveplate is housed in Motorized Rotation Stage 960-0161 and Polarizer with adapter in Kinematic Optical Mount 840-0193 for femtosecond laser application (laser damage threshold: >10 mJ/cm², 50 fs pulse, 800 nm typical).

For High Power Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257HM	1830
266	990-0070-266HM	1830
343	990-0070-343HM	1725
400	990-0070-400HM	1625
390-410	990-0070-400HBM	1775
515	990-0070-515HM	1625
505-525	990-0070-515HBM	1775
800	990-0070-800HM	1625
780-820	990-0070-800HBM	1775
1030	990-0070-1030HM	1625
1010-1050	990-0070-1030HBM	1775

Zero Order Air-Spaced half waveplate is housed in Motorized Rotation Stage 960-0161 and Polarizer with adapter in Kinematic Optical Mount 840-0193 for high power femtosecond laser application (laser damage threshold: >100 mJ/cm², 50 fs pulse, 800 nm typical).

BROADBAND VARIABLE ATTENUATOR FOR FEMTOSECOND LASER PULSES 990-0070HBBi70

Features

- Divides laser beam into two parallel beams of manually adjustable intensity ratio
- Large dynamic range
- Transmitted beam shift ~ 2.6 mm
- High optical damage threshold



990-0070-800HBBi70



990-0070-800HBBi70M

This variable attenuator/beamsplitter consists of a special design opto-mechanical adapter and a precision opto-mechanical holder

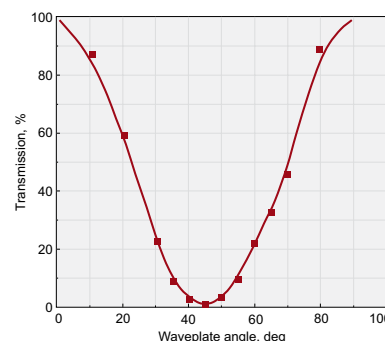
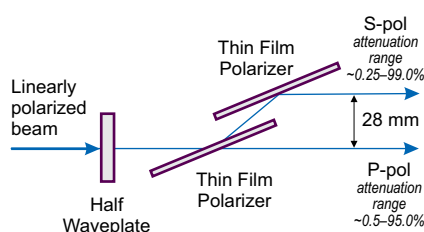
840-0197. Two thin film polarizers, operating at AOI=70° and reflecting s-polarized light while transmitting p-polarized light, are housed into the adapter. A quartz zero order air-spaced half waveplate is housed into the rotating holder 840-0197.

The intensity ratio of outgoing two parallel beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of the exit

beam or outgoing beams intensity ratio can be controlled over a wide dynamic range.

P-polarized beam is transmitted straightly with a 2.6 mm shift and s-polarized beam (after 2 reflections) is parallel to the outgoing p-polarized beam, just separated by 28 mm.

The 840-0197 holder allows to adjust angle of incidence of the thin film polarizers by $\pm 2^\circ$ and to achieve the maximum polarization contrast.



Specifications

Aperture diameter	12 mm
Operating bandwidth	100 nm
Damage threshold	50 mJ/cm ² pulsed at 800 nm, 50 fs, 50 Hz
Polarization contrast (after 1st polarizer)	>1:200
Polarization contrast (after 2nd polarizer)	>1:500

Manual attenuators

Wavelength, nm	Catalogue number	Price, EUR
750-850	990-0070-800HBBi70	1300
980-1080	990-0070-1030HBBi70	1300

Motorized attenuators

Wavelength, nm	Catalogue number	Price, EUR
750-850	990-0070-800HBBi70M	2080
980-1080	990-0070-1030HBBi70M	2080

Ordering information

Please note: these motorized variable attenuators for linearly polarized laser beam are provided without controller and power supply. If you would like to order the complete solution (controller 980-1045 and power supply: PS12-1.5-4), please add CP to code and 695 EUR to price.

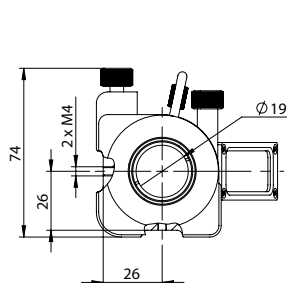
Example:

990-0070-800HBBi70 – motorized attenuator without controller and power supply.

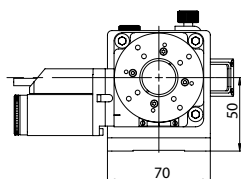
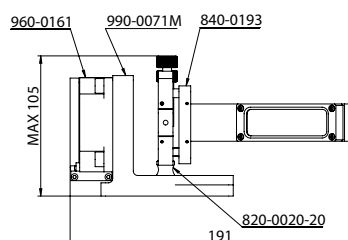
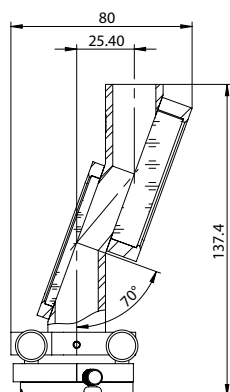
Price – 2080 EUR

990-0070-800HBBi70+CP – motorized attenuator with controller and power supply.

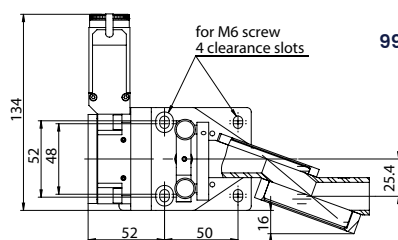
Price – 2775 EUR



990-0070-800HBBi70



990-0070-800HBBi70M



VARIABLE ATTENUATORS FOR LINEARLY POLARIZED LASER BEAM 990-0071

Features

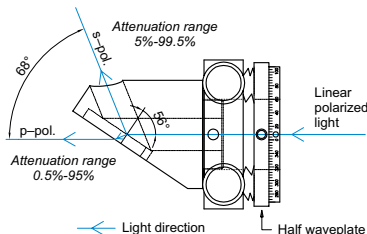
- Divides laser beam into separated by 68° angle two beams of manually adjustable intensity ratio
- Large dynamic range
- Transmitted beam shift ~0.5 mm
- High Optical damage threshold



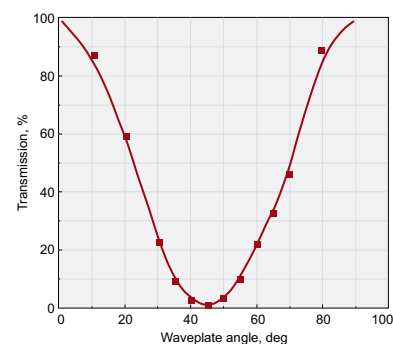
Note: Solid Base Height Extender **820-0210** and Standard Rod **820-0020-20** should be ordered separately

This variable attenuator/beamsplitter consists of special design opto-mechanical adapter for polarizer at 56° 840-0117A or 840-0118A and precision opto-mechanical holder 840-0197. Thin Film Brewster type polarizer, which reflects s-polarized light at 56° while transmitting p-polarized light, is housed into adapter for polarizer at 56°. Quartz Half Waveplates are housed in rotating holder 840-0197.

The intensity ratio of those two beams may be continuously varied without alteration of other beam parameters by rotating the



waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high-purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place. The holder 840-0197 allows to adjust angle of incidence of the Thin Film Brewster type polarizer by $\pm 2^\circ$ and to get the maximum polarization contrast.



For Nd:YAG Laser Applications

Aperture diameter	10 mm
Damage threshold	5 J/cm ² pulsed at 1064 nm, typical
Polarization Contrast	>1:200
Weight	0.25 kg

For Nd:YAG Laser Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266H *	690
355	990-0071-355	475
532	990-0071-532	475
1064	990-0071-1064	475

Multi order half waveplate is housed in rotating holder 840-0197 for Nd:YAG laser pulses (laser damage threshold: 5 J/cm² pulsed at 1064 nm, typical).

* With Zero Order Air-Spaced half waveplate.

For Femtosecond Applications

Aperture diameter	10 mm
Damage threshold	>10 mJ/cm ² , 50 fs pulse at 800 nm, typical
for high power laser applications	>100 mJ/cm ² , 50 fs pulse, 800 nm typical
Polarization Contrast	>1:200
Weight	0.25 kg

For Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
257	990-0071-257	655
266	990-0071-266	655
343	990-0071-343	630
400	990-0071-400	580
390-410	990-0071-400B	680
515	990-0071-515	580
505-525	990-0071-515B	680
800	990-0071-800	580
780-820	990-0071-800B	680
1030	990-0071-1030	580
1010-1050	990-0071-1030B	680

Zero order optically contacted half waveplate is housed in rotating holder 840-0197 for femtosecond laser pulses (laser damage threshold: >10 mJ/cm², 50 fs pulse at 800 nm, typical).

For High Power Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
257	990-0071-257H	720
266	990-0071-266H	720
343	990-0071-343H	695
400	990-0071-400H	645
390-410	990-0071-400HB	745
515	990-0071-515H	645
505-525	990-0071-515HB	745
800	990-0071-800H	645
780-820	990-0071-800HB	745
1030	990-0071-1030H	645
1010-1050	990-0071-1030HB	745

Zero Order Air-Spaced half waveplate is housed in rotating holder 840-0197 for high power femtosecond applications (laser damage threshold: >100 mJ/cm², 50 fs pulse, 800 nm typical).

MOTORIZED VARIABLE ATTENUATOR FOR LINEARLY POLARIZED LASER BEAM 990-0071M



This motorized variable attenuator/beamsplitter consists of special design opto-mechanical adapter for polarizer at 56° 840-0117A or 840-0118A and precision opto-mechanical holder 840-0193. Thin Film Brewster type polarizer, which reflects s-polarized light at 56° while transmitting p-polarized light, is housed into adapter for polarizer at 56°. Quartz Half Waveplates are housed in motorized rotation stage 960-0161.

The intensity ratio of those two beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high-purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place. The holder 840-0193 allows to adjust angle of incidence of the Thin Film Brewster type polarizer by $\pm 2^\circ$ and to get the maximum polarization contrast.

Ordering information

Please note: these motorized variable attenuators for linearly polarized laser beam are provided without controller and power supply. If you would like to order the complete solution (controller 980-1045 and power supply: PS12-1.5-4), please add CP to code and 695 EUR to price.

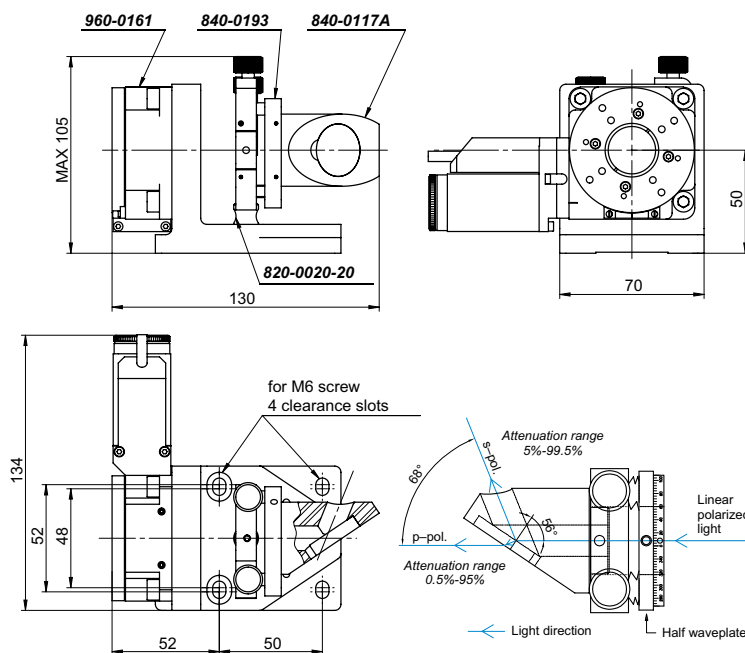
Example:

990-0071-266M – motorized attenuator without controller and power supply.

Price – 1435 EUR

990-0071-266M+CP – motorized attenuator with controller and power supply.

Price – 2130 EUR



For Nd:YAG Laser Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266HM *	1500
355	990-0071-355M	1290
532	990-0071-532M	1260
1064	990-0071-1064M	1260

Multi order half waveplate is housed in Motorized Rotation Stage 960-0161 and Polarizer with adapter in Kinematic Optical Mount 840-0193 for Nd:YAG laser application (laser damage threshold: 5 J/cm², 10 ns pulses, 10 Hz at 1064 nm, typical).

* With Zero Order Air-Spaced half waveplate.

For Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266M	1435
343	990-0071-343M	1410
400	990-0071-400M	1360
390 – 410	990-0071-400BM	1460
515	990-0071-515M	1360
505 – 525	990-0071-515BM	1460
800	990-0071-800M	1360
780 – 820	990-0071-800BM	1460
1030	990-0071-1030M	1360
1010 – 1050	990-0071-1030BM	1460

Zero order optically contacted half waveplate is housed in Motorized Rotation Stage 960-0161 and Polarizer with adapter in Kinematic Optical Mount 840-0193 for femtosecond laser application (laser damage threshold: >10 mJ/cm², 50 fs pulse, 800 nm typical).

For High Power Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266HM	1500
343	990-0071-343HM	1475
400	990-0071-400HM	1425
390 – 410	990-0071-400HBM	1525
515	990-0071-515HM	1425
505 – 525	990-0071-515HBM	1525
800	990-0071-800HM	1425
780 – 820	990-0071-800HBM	1525
1030	990-0071-1030HM	1425
1010 – 1050	990-0071-1030HBM	1525

Zero Order Air-Spaced half waveplate is housed in Motorized Rotation Stage 960-0161 and Polarizer with adapter in Kinematic Optical Mount 840-0193 for high power femtosecond laser application (laser damage threshold: >100 mJ/cm², 50 fs pulse, 800 nm typical).

VARIABLE ATTENUATOR FOR FEMTOSECOND LASER PULSES 990-0072

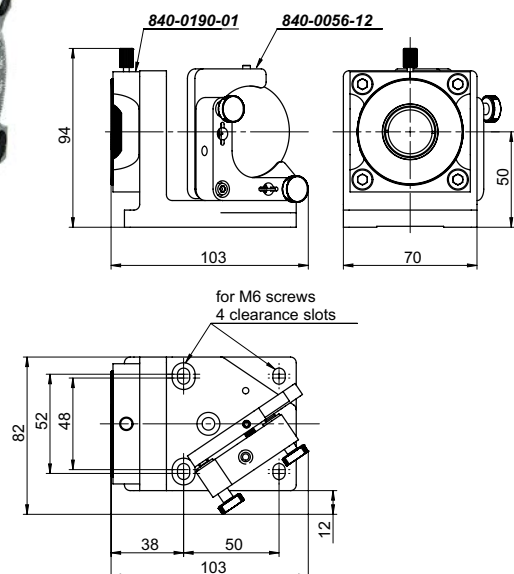
Features

- Divides laser beam into two beams of manually adjustable intensity ratio separated by 68° angle
- Large dynamic range
- Transmitted beam shift ~1 mm
- High optical damage threshold

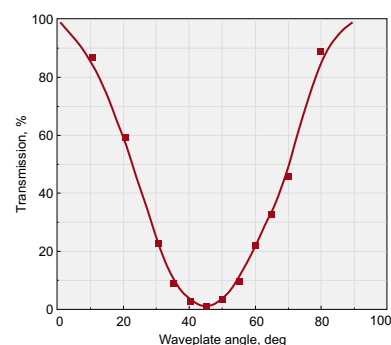


Check www.eksmaoptics.com for motorized version 990-0072M

This variable attenuator/beamsplitter consists of Polarizer Holder 840-0190-01 and Kinematic Mirror/Beamsplitter Mount 840-0056-12. UVFS Thin Film Brewster type polarizer diameter 50.8 mm, which reflects s-polarized light while transmitting p-polarized light, is housed into Beamsplitter Mount 840-0056-12. A quartz Zero Order (optically contacted) Half Waveplate Ø25.4 mm (for femtosecond applications), quartz Zero Order



Air-Spaced Half Waveplate (for high power femtosecond applications) or quartz Multi Order Half Waveplate Ø25.4 mm (for Nd:YAG laser applications) is housed in rotating polarizer holder 840-0180-A1 and placed in the incident linearly polarized laser beam. The intensity ratio of those two separated and different polarized beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high-purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place.



For Nd:YAG Laser Applications

Clear Aperture diameter	22 mm
Damage threshold	>5 J/cm², 10 ns pulse, 10 Hz at 1064 nm, typical
Polarization Contrast	>1:200
Transmitted beam shift	~ 1 mm
Weight	0.45 kg

A quartz Multi Order Half Waveplate Ø25.4 mm is housed in rotating holder 840-0180-A1.

For Nd:YAG Laser Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266H *	1115
355	990-0072-355	795
532	990-0072-532	765
1064	990-0072-1064	785

* A quartz Zero Order Air-Spaced Half Waveplate clear aperture Ø22 mm is housed in rotating holder 840-0190-01.

For Femtosecond Applications

Clear aperture diameter	22 mm
Damage threshold	>10 mJ/cm², 50 fs pulse at 800 nm, typical
for high power applications	>100 mJ/cm², 50 fs pulse at 800 nm, typical
Polarization contrast	>1:200
Transmitted beam shift	~ 1 mm
Weight	0.45 kg

A quartz Zero Order (optically contacted) Half Waveplate (for femtosecond applications) or Zero Order Air-Spaced Half Waveplate (for high power applications) Ø25.4 mm are housed in rotating holder 840-0190-01.

For Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266	980
343	990-0072-343	925
400	990-0072-400	895
515	990-0072-515	895
800	990-0072-800	910
780 – 820	990-0072-800B	1010
1030	990-0072-1030	920
1010 – 1050	990-0072-1030B	1010

For High Power Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266H	1115
343	990-0072-343H	1060
400	990-0072-400H	1030
515	990-0072-515H	1030
800	990-0072-800H	1045
780 – 820	990-0072-800HB	1145
1030	990-0072-1030H	1055
1010 – 1050	990-0072-1030HB	1145

VARIABLE ATTENUATOR FOR FEMTOSECOND AND Nd:YAG LASER PULSES 990-0073

Features

- Divides laser beam into two beams of manually adjustable intensity ratio separated by 68° angle
- Large dynamic range
- Transmitted beam shift ~1.4 mm
- High optical damage threshold
- Motorized version available on request



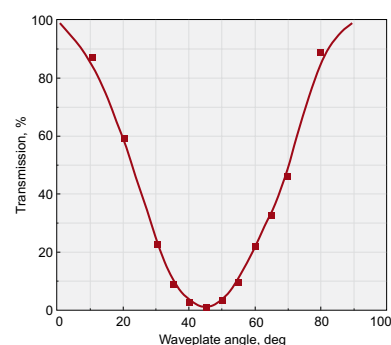
This variable attenuator/beamsplitter consists of Polarizer Holder 840-0180-A2 and Kinematic Mirror/Beamsplitter Mount 840-0056-13. UVFS Thin Film Brewster type polarizer Ø76.2 mm, which reflects s-polarized light while transmitting p-polarized light, is housed into Beamsplitter Mount 840-0056 13. A quartz Zero Order (optically contacted) Half Waveplate Ø40 mm (for femtosecond applications), Zero Order Air-Spaced Half Waveplate (for high power femtosecond applications) or quartz Multi Order Half Waveplate Ø40 mm

(for Nd:YAG laser applications) is housed in rotating polarizer holder 840-0180-A2 and placed in the incident linearly polarized laser beam. The intensity ratio of those two separated and different polarized beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place.

For Femtosecond Applications

Clear aperture diameter	36 mm
Damage threshold	>10 mJ/cm², 50 fs pulse at 800 nm, typical
for high power applications	>100 mJ/cm², 50 fs pulse at 800 nm, typical
Polarization contrast	>1:200
Transmitted beam shift	~ 1.4 mm
Weight	0.6 kg

A quartz Zero Order (optically contacted) Half Waveplate Ø40 mm (for femtosecond applications) or Zero Order Air-Spaced Half Waveplate (for high power applications) is housed in rotating polarizer holder 840-0180-A2.



For Nd:YAG Laser Applications

Clear aperture diameter	36 mm
Damage threshold	>5 J/cm², 10 ns pulse, 10 Hz at 1064 nm, typical
Polarization contrast	>1:200
Transmitted beam shift	~ 1.4 mm
Weight	0.6 kg

Quartz Multi Order Half Waveplate Ø40 mm is housed in rotating polarizer holder 840-0180-A2.

For Nd:YAG Laser Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266H *	1820
355	990-0073-355	1490
532	990-0073-532	1470
1064	990-0073-1064	1545

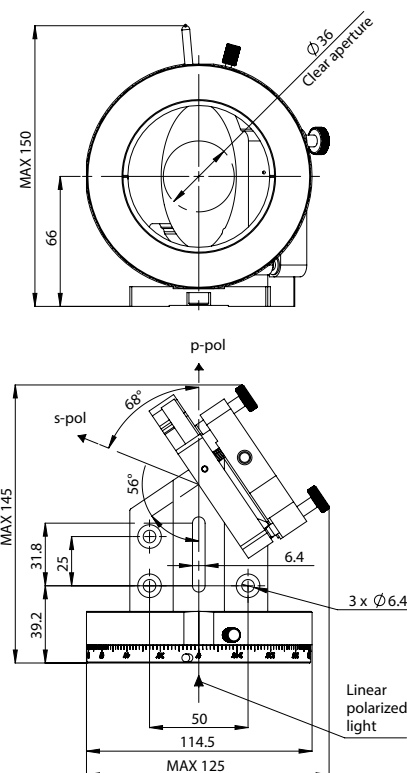
* Zero Order Air-Spaced half waveplate is housed in rotating holder.

For Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266	1720
343	990-0073-343	1590
400	990-0073-400	1570
515	990-0073-515	1570
800	990-0073-800	1590
780 – 820	990-0073-800B	1820
1030	990-0073-1030	1645
1010 – 1050	990-0073-1030B	1880

For High Power Femtosecond Applications

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266H	1820
343	990-0073-343H	1690
400	990-0073-400H	1670
515	990-0073-515H	1670
800	990-0073-800H	1690
780 – 820	990-0073-800HB	1920
1030	990-0073-1030H	1745
1010 – 1050	990-0073-1030HB	1980



COMPACT MOTORIZED LASER POWER ATTENUATOR 990-0075



Features

- Compact design
- High optical damage threshold
- Full solution – includes controller, software, power supply and USB cable
- Standard models for the most popular laser wavelengths are offered ex-stock

990-0075 series laser power attenuator is a compact motorized device for laser power control of linearly polarized beam. Its operation principle consists of changing laser beam polarization by rotation of zero order half-waveplate and then passing the beam through a fixed Brewster type thin film polarizer which transmits p-polarized and reflects s-polarized laser beam. The intensity ratio of s- and p- polarized beams can be continuously varied without alteration of other beam parameters by motorized rotation of the waveplate. The device combines unique mechanical design which ensures repeatability and high stability of performance. A secondary laser beam with s-polarization can be rejected from the laser power

attenuator unit to an external beam dump or utilized for the particular application. A standard compact external beam dump is optionally offered with this attenuator and is suitable for lasers with average power up to 6 W. This beam dump stops secondary s-polarized beam in the attenuator and allows to avoid any thermal effects or stress in the housing of the device.

Standard Kit includes:

- Motorized laser power attenuator
- Controller
- Software
- Power supply (DC 12 V)
- USB cable (1.5 m)

Optical Specifications

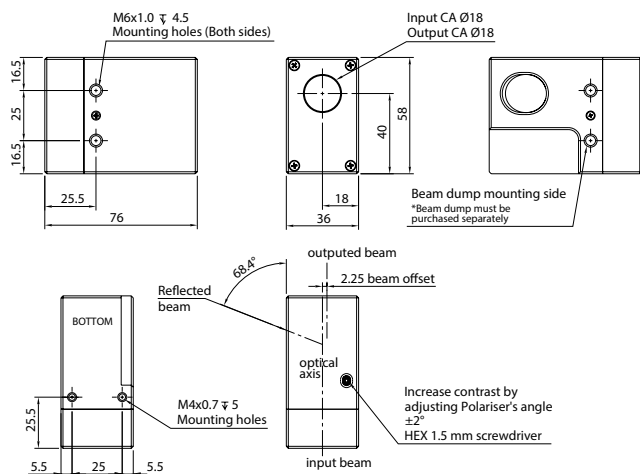
Clear input aperture	Ø18 mm
Clear output aperture	Ø18 mm
Power attenuation range	<0.1 % to >98 %
LIDT coating	>10 J/cm ² , 10 ns @ 1064 nm
Close to open time	< 0.2 sec
Resolution	175,542 μ steps in full rotation (0.002 deg, 7.2 arcsec, 0.035 mrad)
Accuracy (repeatability after 10,000 positions without homing)	± 10 μ steps (± 0.02 deg, less than ± 0.035 %)
Motor	2 phase stepper motor, 200 steps with 256 μ stepping

Mechanical Specifications

	Length	Width	Height
Attenuator	76 mm	36 mm	58 mm
Attenuator with beam dump	76 mm	52 mm	58 mm
Controller	125 mm	53 mm	31 mm

Operating Conditions

Operating temperature	10 to 40 °C
Storage temperature	-15 to 50 °C



Laser Power Attenuators

Wavelength, nm	LIDT	Catalogue number	Price, EUR
343	3 J/cm ² , 10 ns, 50 Hz @ 343 nm	990-0075-343M	1420
355	3 J/cm ² , 10 ns, 50 Hz @ 355 nm	990-0075-355M	1420
390 – 410	3 J/cm ² , 10 ns, 50 Hz @ 400 nm	990-0075-400M	1420
510 – 520	5 J/cm ² , 10 ns, 50 Hz @ 515 nm	990-0075-515M	1310
532	5 J/cm ² , 10 ns, 50 Hz @ 532 nm	990-0075-532M	1310
780 – 820	8 J/cm ² , 10 ns, 50 Hz @ 800 nm	990-0075-800M	1310
1020 – 1040	10 J/cm ² , 10 ns, 50 Hz @ 1030 nm	990-0075-1030M	1310
1064	10 J/cm ² , 10 ns, 50 Hz @ 1064 nm	990-0075-1064M	1310

Additional Accessories

Catalogue number	Description	Price, EUR
990-0075ABD	Attachable Beam Dump <6W with coated protective window	165
990-0075SBD	Separated Beam Dump < 30 W	175
990-0075C1	RS232 Cable, 1.8 m	15
990-0075C5	RS232 Cable, 5 m	20
990-0075C10	RS232 Cable, 10 m	30
990-0075C15	RS232 Cable, 15 m	35
990-0075RA	DIN35 Rail Adapter	15

COMPACT VARIABLE LASER POWER ATTENUATOR 990-0076

Features

- Attenuation range for reflected beam: 2% – 99.9%
- Attenuation range for transmitted beam: 0.1% – 98%
- Convenient 90° angle between reflected and transmitted beams
- No beam shift at exit

990-0076 Variable Attenuator incorporates a high-performance polarizing cube beamsplitter which reflects s-polarized light at 90° while transmitting p-polarized light. A rotatable $\lambda/2$ waveplate is placed in the incident polarized laser beam. The intensity ratio of the two outgoing beams may be continuously varied

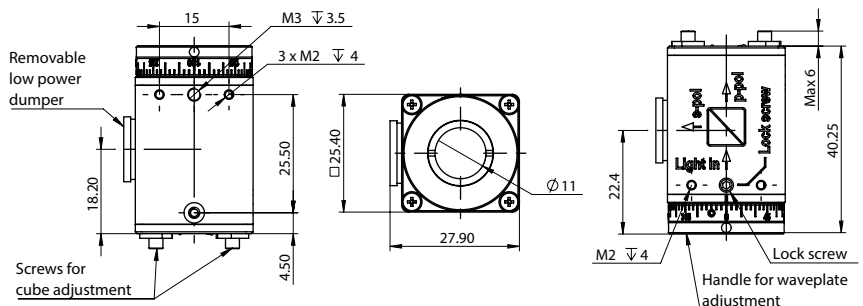
without alteration of other beam parameters by rotating the half waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. Pure p-polarization could be selected for maximum transmission, or pure s-polarization for maximum reflection.

Specifications

Clear aperture diameter	10 mm
Polarization contrast	>1:1000
Weight	0.1 kg



Wavelength, nm	LIDT	Catalogue number	Price, EUR
343	3 J/cm ² @ 355 nm, 10 Hz, 10 ns	990-0076-343	825
355	3 J/cm ² @ 355 nm, 10 Hz, 10 ns	990-0076-355	825
515	6 J/cm ² @ 532 nm, 10 Hz, 10 ns	990-0076-515	800
532	6 J/cm ² @ 532 nm, 10 Hz, 10 ns	990-0076-532	800
1030	15 J/cm ² @ 1030 nm, 10 Hz, 10 ns	990-0076-1030	800
1064	15 J/cm ² @ 1064 nm, 10 Hz, 10 ns	990-0076-1064	800



COMPACT VARIABLE LASER POWER ATTENUATORS – 990-0077, 990-0078

Features

- Attenuation range for transmitted beam:
 - Typical: 0.1% – 98%
 - For 257 nm and 266 nm: 1% – 96%
- Attenuation range for reflected beam
 - Typical: 2% – 99.9%
 - For 257 nm and 266 nm: 4% – 99%
- Extinction ratio: >1:1000
- Clear aperture:
 - 990-0077 – Ø17 mm
 - 990-0078 – Ø22 mm



990-0077 and 990-0078 Laser Power Attenuators

This manual variable attenuator series is designed to continuously attenuate linearly polarized laser beams. They feature precision opto-mechanics and high-LIDT optical components incorporated in a compact housing to ensure stable and reliable performance.

Attenuators are based on Brewster-type thin film polarizer fixed at 56°

and a quartz half waveplate. The Polarizer's angle of incidence can be manually adjusted to get the best contrast or to manipulate the direction of the reflected s-polarized beam. The waveplate is housed in a 360° continuous rotation mount, which can be manually rotated to control the output power of the transmitted and reflected beams.

The intensity of either exit beam or their intensity ratio can be controlled over a wide dynamic range without alteration of other beam parameters. Pure p-polarization could be selected for maximum transmission, or pure s-polarization for maximum reflection.

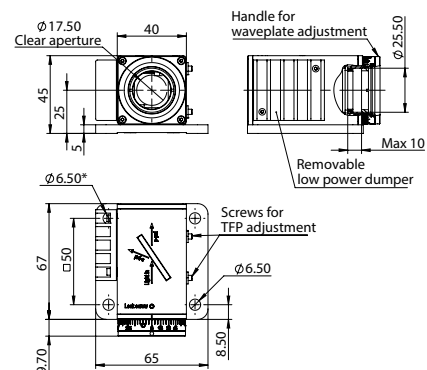
The s-polarization exit port can be blocked with a removable low-power dumper which absorbs laser power up to 5 W. External beam dumps are recommended for high-power applications.

990-0077 COMPACT VARIABLE ATTENUATORS WITH A CLEAR APERTURE OF Ø17 mm

Specifications

Clear aperture diameter	17 mm
Polarization contrast	>1:1000

Wavelength, nm	LIDT	Attenuation range (Tp)	Catalogue number	Price, EUR
257	1 J/cm ² @ 257 nm, 10 Hz, 10 ns	1% – 96%	990-0077-257	1090
266	1 J/cm ² @ 257 nm, 10 Hz, 10 ns	1% – 96%	990-0077-266	1090
343	3 J/cm ² @ 343 nm, 10 Hz, 10 ns	0.1% – 98%	990-0077-343	1015
355	3 J/cm ² @ 355 nm, 10 Hz, 10 ns	0.1% – 98%	990-0077-355	1015
515	5 J/cm ² @ 515 nm, 10 Hz, 10 ns	0.1% – 98%	990-0077-515	925
532	5 J/cm ² @ 532 nm, 10 Hz, 10 ns	0.1% – 98%	990-0077-532	925
1030	10 J/cm ² @ 1030 nm, 10 Hz, 10 ns	0.1% – 98%	990-0077-1030	975
1064	10 J/cm ² @ 1064 nm, 10 Hz, 10 ns	0.1% – 98%	990-0077-1064	975

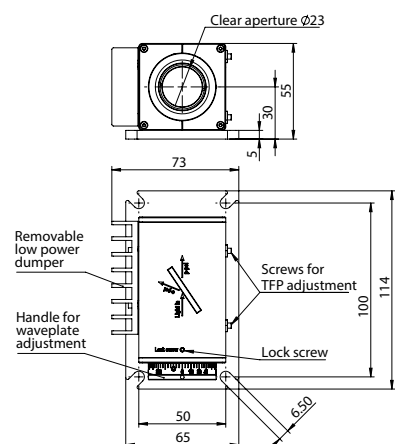


990-0078 COMPACT VARIABLE ATTENUATORS WITH A CLEAR APERTURE OF Ø22 MM

Specifications

Clear aperture diameter	22 mm
Polarization contrast	>1:1000

Wavelength, nm	LIDT	Attenuation range (Tp)	Catalogue number	Price, EUR
257	1 J/cm ² @ 257 nm, 10 Hz, 10 ns	1% – 96%	990-0078-257	1790
266	1 J/cm ² @ 257 nm, 10 Hz, 10 ns	1% – 96%	990-0078-266	1790
343	3 J/cm ² @ 343 nm, 10 Hz, 10 ns	0.1% – 98%	990-0078-343	1650
355	3 J/cm ² @ 355 nm, 10 Hz, 10 ns	0.1% – 98%	990-0078-355	1650
515	5 J/cm ² @ 515 nm, 10 Hz, 10 ns	0.1% – 98%	990-0078-515	1510
532	5 J/cm ² @ 532 nm, 10 Hz, 10 ns	0.1% – 98%	990-0078-532	1510
1030	10 J/cm ² @ 1030 nm, 10 Hz, 10 ns	0.1% – 98%	990-0078-1030	1625
1064	10 J/cm ² @ 1064 nm, 10 Hz, 10 ns	0.1% – 98%	990-0078-1064	1625



AIR-COOLED BEAM DUMP – 990-0800



990-0800

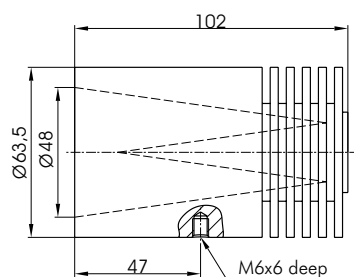
Beam Dump 990-0800 is designed to block CW or pulsed laser beams. It can be used on beams of up to 50 W in the wavelength range from 0.1 to 30 μm . Due to the design of the beam dump, even if the non-reflective coating is damaged by high intensity pulses, there is no backward reflection.

990-0801 is a smaller beam dump designed to block a CW or a pulsed laser beam. It can be used on beams of up to 5 Watts in the wavelength range from 0.1 to 30 μm .

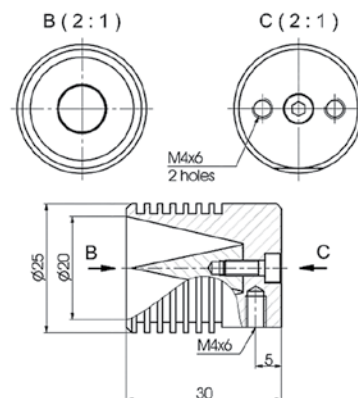
Specifications

Wavelength range	0.1 – 30 μm
Laser type	pulsed, CW

Aperture	Max power	Catalogue number	Price, EUR
48 mm	for beams up to 50 W	990-0800	169
20 mm	for beams up to 5 W	990-0801	119



Drawing of 990-0800



Drawing of 990-0801

WATER-COOLED BEAM DUMP – 990-0820



990-0820

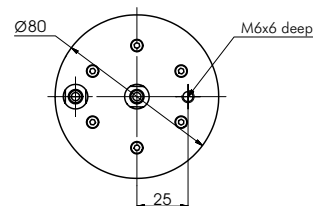
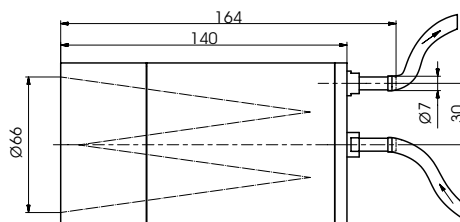
Beam Dump 990-0820 is designed to block CW or pulsed laser beams. It is mainly intended for beams 2 inch wide.

The dump is best suited for beams of up to 1 kW from 0.1 – 30 μm wavelength range. Even if the non-reflective coating is damaged by high intensity pulses, the beam is not reflected back into your optical scheme. The dump mounts on M6 hole on its back.

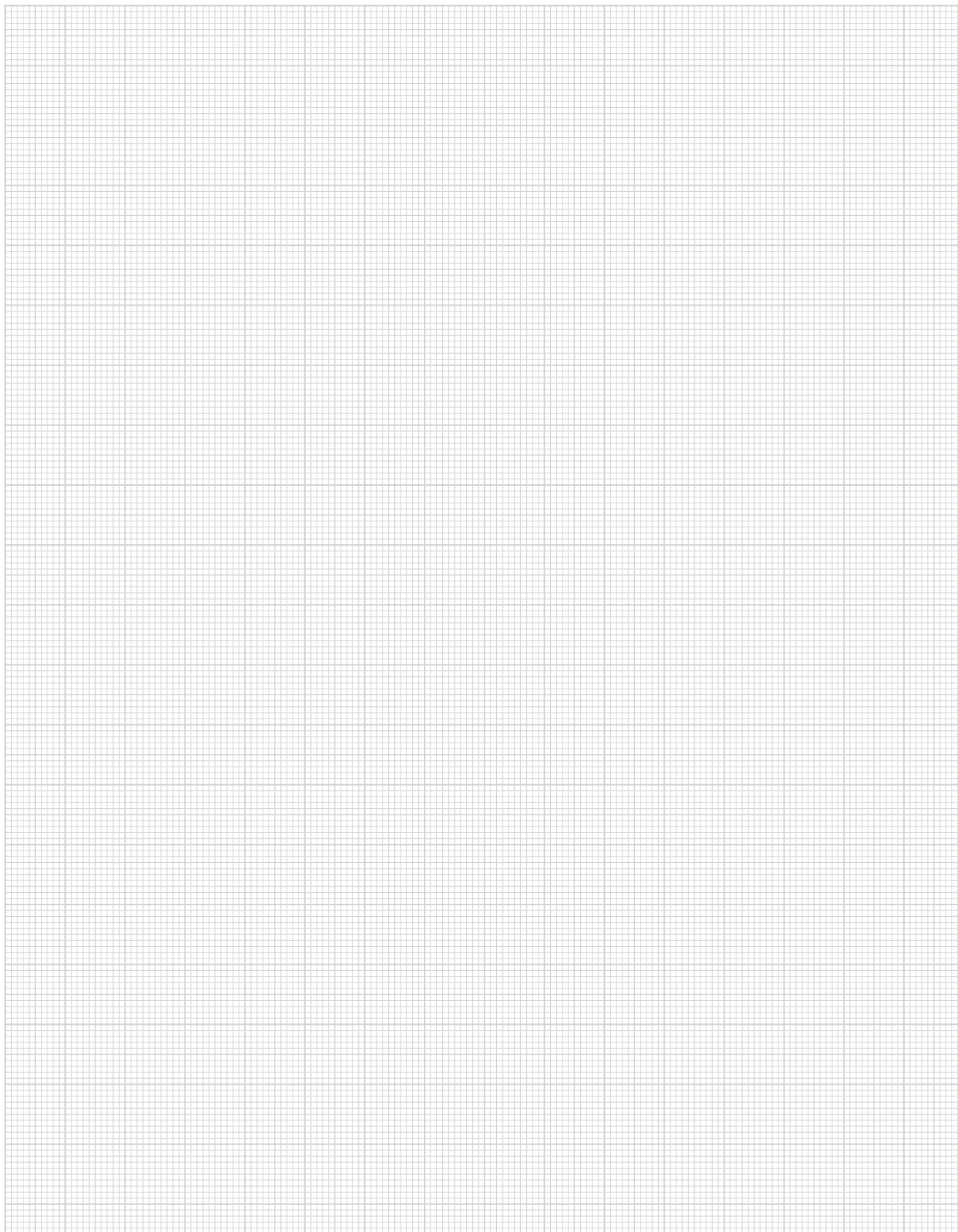
Specifications

Wavelength range	0.1 – 30 μm
Max. handling power	1 kW
Max. energy	50 J (20 Hz)
Acceptance aperture	48 mm (1.89")
Laser type	pulsed, CW
Weight	1.2 kg

Catalogue number	Price, EUR
990-0820	289



Notes





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