

LASER OPTICAL COMPONENTS

*Your Premier Source for High Power and
High Peak Intensity Laser Optics*

Optical Components

Nd:YAG *LaserLine* Optics & Crystals

FemtoLine Optics & Crystals

Nonlinear & Laser Crystals

Optical Systems

Opto-Mechanics



Laser Optical Components

2019 / 2020



TECHNICAL FLEXIBILITY SERVING YOUR PHOTONICS NEEDS

COMPANY

EKSMA OPTICS is a manufacturer and global supplier of precision laser components used in lasers, laser systems and optical instruments. Our laser components are used across different laser and photonics applications in scientific, industry, medical, aesthetic, military and aerospace markets. The coverage of applications of laser optical components by wavelength spectrum starts from UV (193 nm) through VIS up to IR (20 µm) and at THz ranges.

QUALITY

All components provided by the Company are subject to high quality testing and certifications 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 ISO 9001:2015 certified. Certification issued by Bureau Veritas.

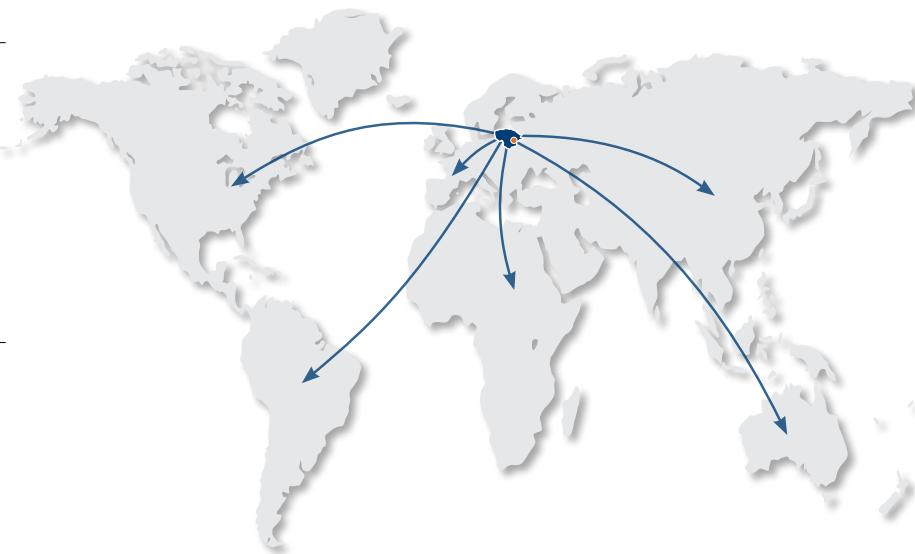


MANUFACTURING

EKSMA OPTICS invested heavily in to advanced manufacturing equipment and extension of manufacturing capabilities.

THE COMPANY OWNS:

- › Cutting, grinding and polishing facility for flat glass and fused silica optics.
- › Polishing facility of nonlinear and electro-optical crystals LBO, BBO, KDP, DKDP, KTP, AgGaSe₂, ZnGeP₂ and other crystals on request.
- › Grinding and polishing facility of spherical and aspherical lenses, including axicons. Lenses are made of N-BK7, S-LAH64 and UVFS in our lens production facility.
- › IBS coatings facility for advanced, exceptional precision thin film coatings used for laser optics and crystals.
- › Assembling facility of electro-optical modulators – Pockels cells based on BBO, DKDP and KTP crystals.



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PRODUCT RANGE



OPTICAL COMPONENTS

- › Coatings
- › Mirrors
- › Lenses & Lens Kits
- › Windows
- › Filters
- › Prisms
- › Polarizing Optics
- › UV & IR Optics

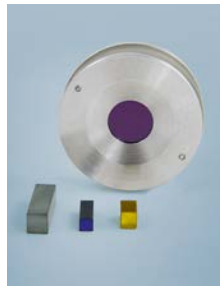


POCKELS CELLS, DRIVERS & PULSE PICKING

- › BBO Pockels Cells
- › KD*P Pockels Cells
- › KTP Pockels Cells
- › Mounting Stages
- › Drivers & HV Power Supplies
- › Q-Switching Kits

NONLINEAR & LASER CRYSTALS

- › Nonlinear Crystals
- › Laser Crystals
- › Crystals for Stimulated Raman Scattering
- › Passive Q-Switches
- › Crystal Ovens & Holders
- › Laser Safety Goggles and Visualizers



OPTO-MECHANICAL COMPONENTS

- › Optical Tables
- › Brackets & Rails
- › Base Mounts & Accessories
- › Optical Mounts
- › Optical Positioners
- › Translation & Rotation Stages
- › Motorized Positioners



Nd:YAG LASERLINE COMPONENTS

- › Mirrors
- › Windows
- › AR Coated Lens Kits
- › Polarizing Optics
- › Nd:YAG rods and slabs
- › Harmonics Crystals

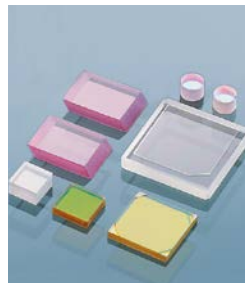


OPTICAL SYSTEMS

- › Beam Expanders
- › F-Theta Lenses
- › Variable Attenuators for Linearly Polarized Laser Pulses
- › Gauss-to-Top Hat Beam Shaping Lens
- › Iris Diaphragms

FEMTOLINE COMPONENTS

- › Mirrors
- › Thin Lenses
- › AR Coated Lens Kits
- › Polarizing Optics
- › Yb:KYW, Yb:KGW Laser Crystals
- › Harmonics Crystals for Yb doped and Ti:Sapphire Lasers



LASER ELECTRONICS

- › Laser Diode Drivers
- › Laser Synchronization Modules
- › Ultrafast Pulse Picking Systems



Online product catalogue

www.eksmaoptics.com

FEATURED PRODUCTS

OPTICAL
COMPONENTS

Anti-Reflection Coated Cylindrical and Spherical Lens Kits

- › Lenses made of N-BK7 or UV FS
- › Various focal lengths
- › Uncoated, BBAR or AR coated

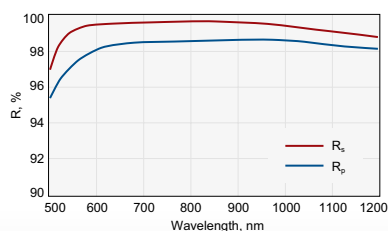


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NONLINEAR & LASER
CRYSTALS

Enhanced Silver Mirrors

- › Designed for use with femtosecond lasers
- › Group Delay Dispersion $< |5 \text{ fs}^2|$
- › $R > 98.5\%$ @ 600-1100 nm

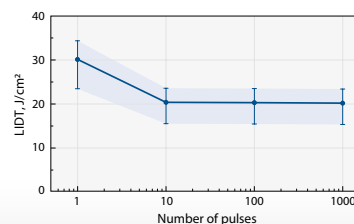


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Nd:YAG LASERLINE
COMPONENTS

High Power IBS Coated Laser Mirrors

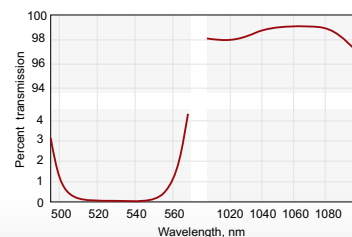
- › Designed for use with nanosecond, picosecond or femtosecond lasers
- › High laser damage threshold
- › Reflectivity $> 99.9\%$



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Laser Harmonic Separators with High Transmission

- › Designed for Nd:YAG lasers
- › HR $> 99.5\%$ and HT $> 99\%$
- › LDT $> 10 \text{ J/cm}^2$, 8 nsec, 1064 nm

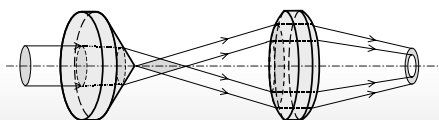


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FEMTOLINE
COMPONENTS

Precision Plano-Convex Axicons

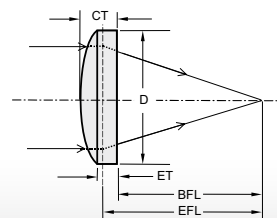
- › Made of BK7 or UVFS
- › Range of cone apex angles: 140° to 179°
- › Can be supplied with AR or BBAR coatings



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CNC Polished Precision Aspherical Lenses

- › Made of N-BK7, N-LAH64 or UVFS
- › Can be supplied with AR coatings



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OPTICAL
SYSTEMS

Broadband Variable Attenuators for Femtosecond Lasers

- › Divides beam into two parallel beams
- › Wavelength ranges: 750-850 nm or 980-1080 nm
- › LDT $> 50 \text{ mJ/cm}^2$, 50 fsec, 50 Hz, 800 nm
- › Manual or motorized



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Heatpoint Oven for Nonlinear Crystals

- › Compact design
- › For crystals up to $6 \times 6 \times 30 \text{ mm}$
- › Preset temperature: $30 - 80^\circ \text{C}$
- › Special 1" positioning mount available



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OPTO-MECHANICAL
COMPONENTS

Femtokits for Third Harmonic Generation of Ti:Sapphire Laser

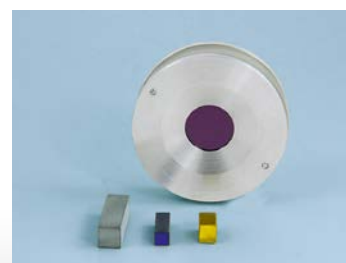
- › 150-250 fsec
- › 120-150 fsec
- › 70-120 fsec
- › 30-70 fsec
- › 15-30 fsec



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Infrared Nonlinear Crystals

- › ZnGeP₂ crystals
- › AgGaSe₂ crystals
- › AgGaS₂ crystals
- › GaSe crystals
- › For frequency conversion in $0.8-18 \mu\text{m}$ range



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ORDERING INFORMATION

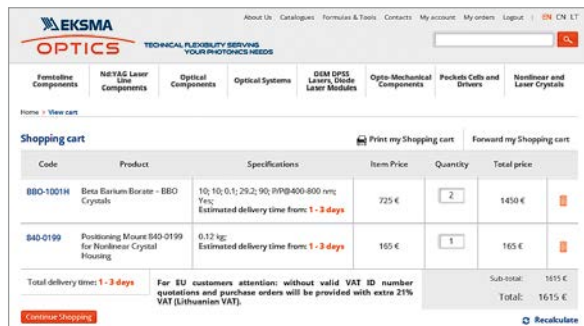
PRICES

Prices are indicated F.C.A. Vilnius, Lithuania and are exclusive of any taxes, duties or freight. Quantity as well as research application discounts are subject to quote. EKSMA OPTICS reserves the right to change prices without prior written notice.

PRODUCT DELIVERY TIME

Most of the standard products provided in catalogue are available for fast-off-the shelf delivery. Delivery time of the stock products can be estimated on the website. Estimated product delivery time is displayed on each product page. Search in our e-shop using product code.

If delivery term is indicated as "Request", please add the required items to the shopping cart and choose "Official Quotation". Our sales team will contact you soon and provide the estimated delivery time for the shopping cart.



Code	Product	Specifications	Item Price	Quantity	Total price
BBO-1001H	Beta Barium Borate - BBO Crystals	10; 10; 0.1; 252; 90; PPH-400-800 nm; Yes; Estimated delivery time from: 1 - 3 days	725 €	2	1450 €
BAD-0199	Positioning Mount BAD-0199 for Nonlinear Crystal Housing	0.12 kg; Estimated delivery time from: 1 - 3 days	165 €	1	165 €
Total delivery time: 1 - 3 days			Sub-total:		1615 €
For EU customers attention: without valid VAT ID number quotations and purchase orders will be provided with extra 21% VAT (Lithuanian VAT).			Total:		1615 €

SHIPPING

EKSMA Optics works with the biggest express freight carriers (UPS, DHL, FedEx). Other freight forwarders are available on request. If not specified by customer, the default freight forwarder is DHL or UPS (depending on the country). Final shipping costs are subject to quote depending on individual order. EKSMA Optics reserves the right to change the prices without prior written notice depending on freight forwarder's pricing. Shipping charges are prepaid and added as a separate item to the invoice.

EKSMA OPTICS offers free shipping* for online orders. Orders placed through our e-shop will be delivered to customer using DHL or UPS. Import duty if applicable must be paid by customer. Offer applies to orders placed online that weight below 2 kg only and are over 300 EUR or 500 USD.

* free shipping offer for our distributors is applied only if the order is over 500 EUR.

** free shipping is applied for orders that are sent only via website and is not applied for orders sent directly to info@eksmaoptics.com.

CERTIFICATE OF ORIGIN

All items shown in this catalogue are of Lithuanian Origin (EU). Certificate of Origin is available under request.

ORDERING

Purchase orders to EKSMA OPTICS can be placed using our e-shop, by e-mail or by fax. Customs paperwork and fees if any applied must be handled by customers.

COMPANY DETAILS

Optolita uab (legal company name)

Mokslininku str. 11, LT-08412 Vilnius, Lithuania

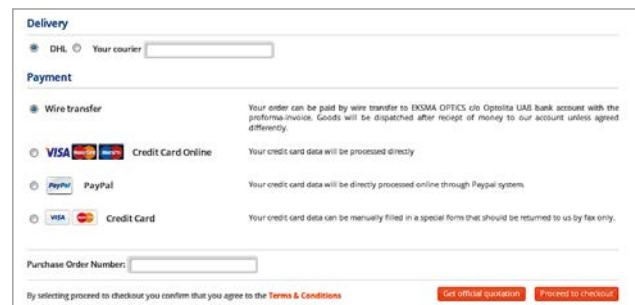
Company Code: 300624547; VAT No.: LT100002802516

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E-mail: info@eksmaoptics.com

PAYMENT OPTIONS

Standard payment options include online credit card payments (using PayPal or PaySera services) or wire transfer.



Delivery

☐ DHL ☐ Your courier

Payment

☒ Wire transfer
Your order can be paid by wire transfer to EKSMA OPTICS c/o Optolita UAB bank account with the proforma-invoice. Goods will be dispatched after receipt of money to our account unless agreed differently.

☐ VISA ☐ MasterCard ☐ Credit Card Online
Your credit card data will be processed directly

☐ PayPal
Your credit card data will be directly processed online through Paypal system

☐ VISA ☐ MasterCard ☐ Credit Card
Your credit card data can be manually filled in a special form that should be returned to us by fax only.

Purchase Order Number:

By selecting proceed to checkout you confirm that you agree to the [Terms & Conditions](#)

[Get official quotation](#) [Proceed to checkout](#)

WIRE TRANSFER DETAILS

Account number (IBAN)	LT16 7044 0600 0577 4220
Bank name	AB SEB Bankas
Bank address	Gedimino Ave. 12, LT-01103 Vilnius, LITHUANIA
SWIFT Code	CBVILT2X
Beneficiary	OPTOLITA UAB

Please note that customer's bank transfer fee associated with payment service should be paid by customer.

RETURN POLICY

30 days customer satisfaction warranty covers all standard products. Please contact EKSMA OPTICS if you are not satisfied with the product to arrange a refund. EKSMA OPTICS does not cover any costs associated with shipping.

WARRANTY

All products are guaranteed to be free from defects in material and workmanship for a period of 1 year after delivery. EKSMA OPTICS does not assume liability from installation, labour or consequential damages.

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OPTICAL COMPONENTS CLEANING INSTRUCTIONS

See page A.4

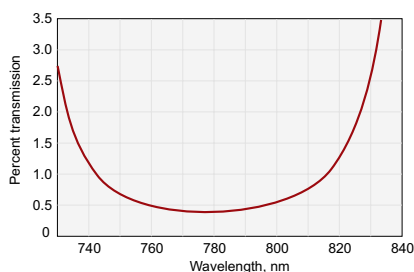
Coatings

HIGH REFLECTIVITY COATINGS

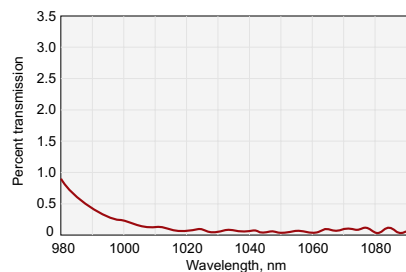
These multilayer coatings are stacks intended to achieve the highest possible reflectivity at specific laser line wavelengths at normal or 45 degrees incidence. Laser line high reflectivity coatings are intended for external beam manipulation applications where even slight losses may be intolerable.

For appropriate coating, please add the number of the chosen coating to the required optical component catalogue number.

LASER LINE COATINGS



1031. HR>99.5% @ 780 nm, AOI = 45°.

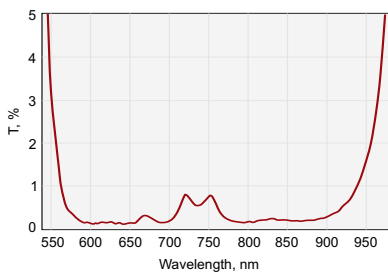


1037. HR>99.8% @ 1064 nm, AOI = 0°.

Wavelength, nm	AOI = 0°		AOI = 45°		Recommended substrate	Damage threshold, J/cm² in 10 ns
	Reflectivity, %	Coating number	Reflectivity, %	Coating number		
226	>99	1007-i0	>99	1007-i45	UV FS	1
248	>99	1009-i0	>99	1009-i45	UV FS	1.5
266	>99.5	1011-i0	>99	1011-i45	UV FS	1.5
308	>99.5	1013-i0	>99.2	1013-i45	UV FS	1.5
325	>99.5	1015-i0	>99.2	1015-i45	UV FS	1.5
337	>99.7	1017-i0	>99.5	1017-i45	UV FS	1.5
355	>99.7	1019-i0	>99.5	1019-i45	UV FS	1.5
400	>99.7	1021-i0	>99.5	1021-i45	UV FS	1.5
473	>99.7	1023-i0	>99.5	1023-i45	UV FS, BK7	1.5
488-515	>99.7	1024-i0	>99.5	1024-i45	UV FS, BK7	1.5
532	>99.7	1025-i0	>99.5	1025-i45	UV FS, BK7	5
589	>99.7	1027-i0	>99.5	1027-i45	UV FS, BK7	5
616	>99.7	1029-i0	>99.5	1029-i45	UV FS, BK7	5
633	>99.7	1030-i0	>99.5	1030-i45	UV FS, BK7	5
780	>99.7	1031-i0	>99.5	1031-i45	UV FS, BK7	5
800	>99.7	1032-i0	>99.5	1032-i45	UV FS, BK7	5
830	>99.7	1033-i0	>99.5	1033-i45	UV FS, BK7	5
852	>99.7	1034-i0	>99.5	1034-i45	UV FS, BK7	5
946	>99.7	1035-i0	>99.5	1035-i45	UV FS, BK7	5
1064	>99.7	1037-i0	>99.5	1037-i45	UV FS, BK7	5
1320	>99.7	1039-i0	>99.5	1039-i45	UV FS, BK7	1.5
1550	>99.7	1045-i0	>99.5	1045-i45	UV FS, BK7	1.5
2000	>99	1047-i0	>99	1047-i45	UV FS, Sapphire	1.5
2100	>99	1049-i0	>99	1049-i45	UV FS, Sapphire	1.5

Contact us for other wavelengths and AOI's values.

BROADBAND COATINGS



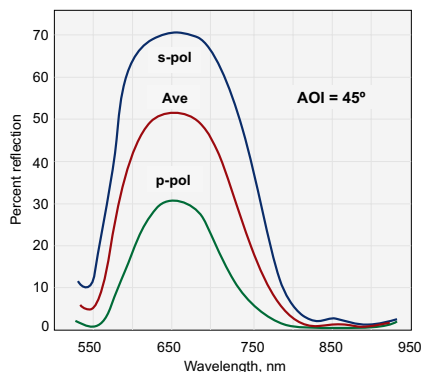
1130. HR>99% @ 600-900nm, AOI= 0°.

Wavelength, nm	AOI = 0°		AOI = 45°		Recommended substrate	Damage threshold, J/cm² in 10 ns
	Reflectivity, %	Coating number	Reflectivity, %	Coating number		
220-250	>99	1106-i0	>99	1106-i45	UV FS	1
260-340	>99	1110-i0	>99	1110-i45	UV FS	1
350-450	>99	1114-i0	>99	1114-i45	UV FS	1
420-680	>99	1116-i0	>99	1116-i45	UV FS, BK7	1
600-900	>99	1130-i0	>99	1130-i45	UV FS, BK7	1
720-880	>99	1132-i0	>99	1132-i45	UV FS, BK7	1
760-840	>99	1133-i0	>99	1133-i45	UV FS, BK7	1
900-1100	>99	1142-i0	>99	1142-i45	UV FS, BK7	1.5
1100-1400	>99	1144-i0	>99	1144-i45	UV FS, BK7	1.5

Contact us for other wavelengths and AOI's values.

PARTIAL REFLECTING COATINGS

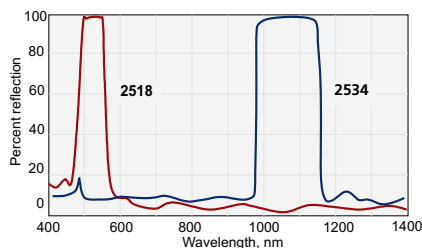
Partial reflecting coatings are durable multilayer dielectric coatings intended for efficient beam splitting as well as for output coupling in laser cavities. They are used in high power laser applications. Please refer to the Substrates for Laser Mirrors or Windows section for substrates for these coatings.



Wavelength, nm	Reflectivity, %	Coating number		Recommended substrate	Damage threshold, J/cm ² in 10 ns
		AOI = 0°	AOI = 45°		
248	25±3	2012-i0	2012-i45	UV FS	1
	50±3	2015-i0	2015-i45		
	75±3	2017-i0	2017-i45		
266	25±3	2022-i0	2022-i45	UV FS	1
	50±3	2025-i0	2025-i45		
	75±3	2027-i0	2027-i45		
308	25±3	2032-i0	2032-i45	UV FS	1
	50±3	2035-i0	2035-i45		
	75±3	2037-i0	2037-i45		
355	25±3	2042-i0	2042-i45	UV FS	2
	50±3	2045-i0	2045-i45		
	75±3	2047-i0	2047-i45		
400	25±3	2052-i0	2052-i45	UV FS	3
	50±3	2055-i0	2055-i45		
	75±3	2057-i0	2057-i45		
532	25±3	2062-i0	2062-i45	UV FS, BK7	3
	50±3	2065-i0	2065-i45		
	75±3	2067-i0	2067-i45		
633	25±3	2069-i0	2069-i45	UV FS, BK7	1.5
	50±3	2070-i0	2070-i45		
	75±3	2071-i0	2071-i45		
800	25±3	2072-i0	2072-i45	UV FS, BK7	3
	50±3	2075-i0	2075-i45		
	75±3	2077-i0	2077-i45		
852	25±3	2079-i0	2079-i45	UV FS, BK7	1
	50±3	2080-i0	2080-i45		
	75±3	2081-i0	2081-i45		
1064	25±3	2082-i0	2082-i45	UV FS, BK7	3
	50±3	2085-i0	2085-i45		
	75±3	2087-i0	2087-i45		
1550	25±3	2089-i0	2089-i45	UV FS, BK7	2
	50±3	2090-i0	2090-i45		
	75±3	2091-i0	2091-i45		

Contact us for other wavelengths and AOI's values.

LASER HARMONIC SEPARATORS



These harmonic separators comprise a dichroic reflector coating and should be applied on the front surface of high precision windows. They are used to separate the various harmonic components of frequency

doubled laser systems by selective spectral reflection and transmission. In all cases one wavelength is selected out by reflection and the other wavelengths are transmitted.

Wavelength, nm	AOI = 0°			AOI = 45°			Recommended substrate	Damage threshold, J/cm ² in 10 ns
	R, %	T, %	Coating number	R, %	T, %	Coating number		
200-220 / 390-450	>90.0	>85	2506-i0	>90.0	>80	2506-i45	UV FS	1
355 / 532+1064	>99.0	>93	2510-i0	>99.0	>90	2510-i45	UV FS	1
380-420 / 720-820	>99.0	>90	2514-i0	>99.0	>90	2514-i45	UV FS, BK7	1
532 / 1064	>99.5	>95	2518-i0	>99.5	>95	2518-i45	UV FS, BK7	1
600 / 1200	>99.5	>95	2522-i0	>99.5	>95	2522-i45	UV FS, BK7	2
800 / 400	>99.5	>90	2526-i0	>99.5	>90	2526-i45	UV FS, BK7	2
1064 / 400-700	>99.5	>85	2530-i0	>99.5	>80	2530-i45	UV FS, BK7	2
1064 / 532	>99.5	>93	2534-i0	>99.5	>90	2534-i45	UV FS, BK7	2

Contact us for other wavelengths and AOI's values.

ANTI-REFLECTION COATINGS

These multilayer anti-reflection coatings are designed for reducing the reflectivity of a component to near-zero for one very specific wavelength. Therefore, valuable laser energy is efficiently transferred through complex

optical systems rather than being lost to glare and scatter. Our AR coatings are intended for use at normal incidence, and when used in this way will achieve maximum efficiency transmission.

LASER LINE ANTI-REFLECTION COATINGS

STANDARD LASER LINE ANTI-REFLECTION COATINGS

Wavelength, nm	Reflection per surface (AOI=0°)	Laser Damage Threshold, J/cm ²	Coating suffix	Price, EUR	
				Ø25.4	Ø50.8
266	R<0.4%	1	AR266	45	56
333 – 353	R<0.5%	3	AR343	29	50
355	R<0.25%	3	AR355	29	50
380 – 420	R<0.5%	3	AR400	29	50
500 – 530	R<0.3%	5	AR515	29	50
532	R<0.2%	5	AR532	29	50
760 – 840	R<0.4%	8	AR800	35	56
1000 – 1060	R<0.3%	10	AR1030	29	50
1064	R<0.2%	10	AR1064	29	50

IBS LASER LINE ANTI-REFLECTION COATINGS

Wavelength, nm	Reflection per surface (AOI=0°)	Laser Damage Threshold, J/cm ²	Coating suffix	Price, EUR	
				Ø25.4	Ø50.8
333 – 353	R<0.2%	4	AR343HT	135	250
355	R<0.2%	4	AR355HT	135	250
380 – 420	R<0.2%	4	AR400HT	105	180
500 – 530	R<0.1%	7	AR515HT	105	180
532	R<0.1%	7	AR532HT	105	180
760 – 840	R<0.1%	10	AR800HT	105	180
1000 – 1060	R<0.1%	15	AR1030HT	105	180
1064	R<0.1%	15	AR1064HT	105	180

OTHER LASER LINE ANTI-REFLECTION COATING OPTIONS

Wavelength, nm	Damage threshold, J/cm ² in 10 ns	AOI = 0°		AOI = 45°	
		Reflectivity, %	Coating number	Reflectivity, %	Coating number
193	1	< 1.0	3005-i0	<2.0	3005-i45
248	1.5	< 0.8	3007-i0	<1.5	3007-i45
266	1.5	< 0.4	3009-i0	<1.0	3009-i45
308	1.5	<0.3	3011-i0	<0.6	3011-i45
343	2	<0.25	3014-i0	<0.5	3014-i45
351 – 355	2	< 0.25	3015-i0	<0.5	3015-i45
400	2	< 0.25	3017-i0	<0.5	3017-i45
488 – 514	2	< 0.3	3021-i0	<0.5	3021-i45
515	4	< 0.2	3023-i0	<0.5	3023-i45
532	4	< 0.2	3025-i0	<0.5	3025-i45
633 – 650	4	< 0.25	3027-i0	<0.5	3027-i45
780	5	< 0.2	3031-i0	<0.5	3031-i45
800	5	< 0.2	3033-i0	<0.5	3033-i45
850	5	< 0.2	3035-i0	<0.5	3035-i45
1030	5	< 0.2	3036-i0	<0.5	3036-i45
1064	5	< 0.2	3037-i0	<0.5	3037-i45
1320	5	<0.3	3041-i0	<0.5	3041-i45
1547	4	<0.5	3045-i0	<1.0	3045-i45

Contact us for other wavelengths and AOI's values.

DUAL BAND ANTI-REFLECTION COATINGS

STANDARD DUAL BAND ANTI-REFLECTION COATINGS

Wavelength, nm	Reflection per surface (AOI=0°)	Laser Damage Threshold, J/cm ²	Coating suffix	Price, EUR	
				Ø25.4	Ø50.8
515 + 1030	R<0.5%	4	ARD1030	35	56
532 + 1064	R<0.5%	4	ARD1064	35	56

IBS DUAL BAND ANTI-REFLECTION COATINGS

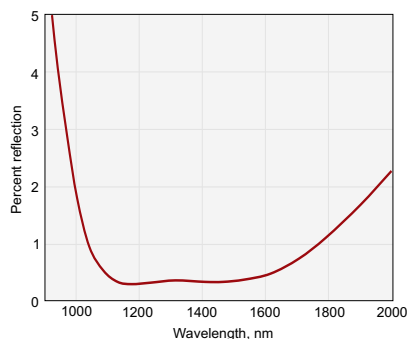
Wavelength, nm	Reflection per surface (AOI=0°)	Laser Damage Threshold, J/cm ²	Coating suffix	Price, EUR	
				Ø25.4	Ø50.8
400 + 800	R<0.2%	4	ARD800HT	125	205
515 + 1030	R<0.1%	6	ARD1030HT	115	195
532 + 1064	R<0.1%	6	ARD1064HT	115	195

OTHER DUAL BAND ANTI-REFLECTION COATING OPTIONS

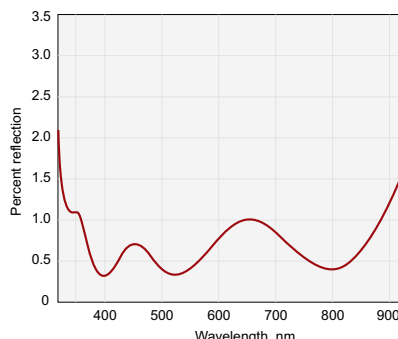
Wavelength, nm	Damage threshold, J/cm ² in 10 ns	AOI = 0°		AOI = 45°	
		Reflectivity, %	Coating number	Reflectivity, %	Coating number
266 + 532	1.5	<0.5	3106-i0	<1.0	3106-i45
355 + 532	2	<0.5	3110-i0	<1.0	3110-i45
355 + 1064	2	<0.5	3114-i0	<1.0	3114-i45
400 + 800	3	<0.5	3118-i0	<1.0	3118-i45
515 + 1030	4	<0.5	3121-i0	<1.0	3121-i45
532 + 1064	4	<0.5	3122-i0	<1.0	3122-i45
670 + 1064	4	<0.5	3126-i0	<1.0	3126-i45
808 + 1064	4	<0.5	3127-i0	<1.0	3127-i45
1064 + 1320	4	<0.5	3130-i0	<1.0	3130-i45
1064 + 1570	3	<0.5	3134-i0	<1.0	3134-i45

Contact us for other wavelengths and AOI's values.

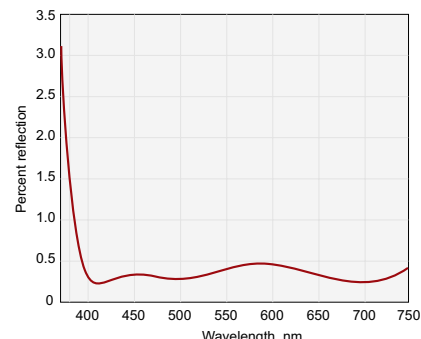
BROADBAND ANTI-REFLECTION COATINGS



ARB1375. R<0.7% @ 1050–1700 nm, AOI=0°.



ARB625. R<1.5% @ 350–900 nm, AOI = 0°.



ARB550. R<0.9% @ 400–700 nm, AOI = 0°.

STANDARD BROADBAND ANTI-REFLECTION COATINGS

Wavelength, nm	Reflection per surface (AOI=0°)	Laser Damage Threshold, J/cm ²	Coating suffix	Price, EUR	
				Ø25.4	Ø50.8
210 – 400	R<2%	1	ARB300	70	85
400 – 700	R<0.9%	2	ARB550	56	67
350 – 900	R<1.5%	2	ARB625	60	78
650 – 1100	R<0.7%	3	ARB825	61	72
700 – 900	R<0.5%	3	ARB800	50	68
1050 – 1700	R<0.7%	2	ARB1375	76	89

IBS BROADBAND ANTI-REFLECTION COATINGS

Wavelength, nm	Reflection per surface (AOI=0°)	Laser Damage Threshold, J/cm ²	Coating suffix	Price, EUR	
				Ø25.4	Ø50.8
450 – 650	R<0.2%	3	ARB550HT	135	215
500 – 700	R<0.2%	4	ARB600HT	115	195
700 – 900	R<0.1%	5	ARB800HT	115	195
900 – 1100	R<0.1%	5	ARB1000HT	115	195

OTHER BROADBAND ANTI-REFLECTION COATING OPTIONS

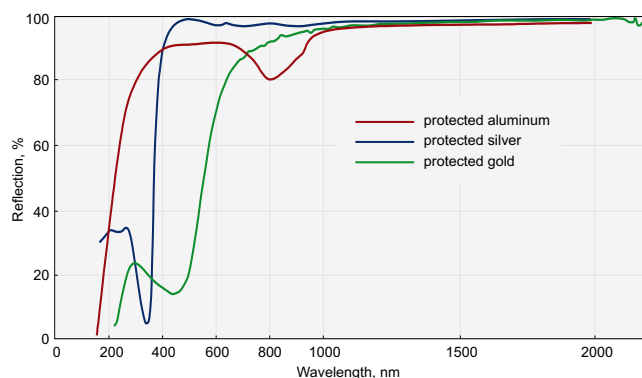
Wavelength, nm	Damage threshold, J/cm ² in 10 ns	AOI = 0°		AOI = 45°	
		Reflectivity, %	Coating number	Reflectivity, %	Coating number
210 – 400	1.5	<2.0	3205-i0	<3.0	3205-i45
250 – 350	1.5	<1.2	3207-i0	<2.5	3207-i45
300 – 400	1.5	<1.0	3209-i0	<2.0	3209-i45
350 – 500	2.0	<0.8	3211-i0	<1.6	3211-i45
350 – 900	2.0	<1.5	3213-i0	<3.0	3213-i45
400 – 550	2.5	<0.4	3215-i0	<0.8	3215-i45
400 – 700	3.0	<0.9	3217-i0	<1.8	3217-i45
420 – 680	3.0	<0.5	3219-i0	<1.0	3219-i45
450 – 750	3.0	<0.5	3221-i0	<1.0	3221-i45
500 – 800	3.0	<0.6	3223-i0	<1.2	3223-i45
500 – 1000	3.0	<1.5	3224-i0	<3.0	3224-i45
600 – 900	3.0	<0.7	3225-i0	<1.2	3225-i45
700 – 900	3.0	<0.5	3227-i0	<1.0	3227-i45
800 – 1200	2.5	<0.7	3229-i0	<1.4	3229-i45
1000 – 1400	2.0	<0.7	3231-i0	<1.4	3231-i45
1050 – 1700	2.0	<1.0	3232-i0	<1.5	3232-i45
1300 – 1700	2.0	<0.7	3233-i0	<1.4	3233-i45
1500 – 2000	1.5	<0.7	3235-i0	<1.4	3235-i45

Contact us for other wavelengths and AOI's values.

METALLIC COATINGS

Protected metallic coatings provide a moderate level of reflection over a very broad spectral range and are widely used as mirrors. These coatings are protected by a thin layer of dielectric material in order to make them durable. Enhanced metallic coatings provide greater reflection across the operating bandwidth. These coatings are enhanced by adding a multilayer dielectric stack.

Metal coatings modify the state of polarization of an incident beam of light and are therefore inappropriate for most polarization sensitive applications.



FEATURES

- › Protected gold
- › Protected aluminium
- › Protected silver
- › Enhanced aluminium

Wavelength, nm	Average reflection, %	Type	Laser Induced Damage Threshold at 1064 nm, 50 Hz, 11 nsec, J/cm ²	Coating number	Price, EUR	
					Ø25	Ø50
250–350	>88	UV enhanced aluminium	0.25	0005	34	52
450–650	>91	VIS enhanced aluminium	0.25	0010	25	40
300–IR	>86	Protected aluminium	0.25	0015	17	28
400–IR	>96	Protected silver	1.8	0025	56	76
900–IR	>98	Protected gold	1.0	0030	82	107

Please contact us for other wavelengths and AOI's.

Windows & Filters

COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

CURVED WINDOWS

FEATURES

- Made from BK7 glass or UV grade fused silica
- Polished to high surface quality
- Standard substrates are available with a variety of radii of concave curvature

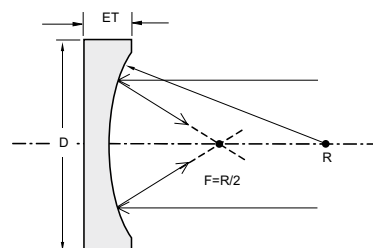
We offer two substrate materials spanning a range of thermal expansion coefficients. For applications in which thermal shock is absent and thermal stability is not critical, BK7 glass is a suitable and inexpensive material. For applications requiring high thermal stability or involving severe thermal shock, UV grade fused silica is a good choice.

SPECIFICATIONS

Material	BK7, UV FS
S1/S2 Surface Quality	20 – 10 scratch & dig (MIL-PRF-13830B)
S1/S2 Surface Flatness	$\lambda/10$ @ 633 nm
Curved Surface Radius Tolerance	$\pm 1\%$
Diameter Tolerance	+0.00 / -0.12 mm
Thickness Tolerance	± 0.2 mm

PLANO-CONCAVE WINDOWS

Presented substrates are *uncoated*. For appropriate coating, please refer to the *Coatings section*.



Diameter D, mm	Edge thickness ET, mm	ROC, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
12.7	3.0	-25	010-0101E	32	010-1101E	57
12.7	3.0	-50	010-0103E	32	010-1103E	57
12.7	3.0	-75	010-0104E	32	010-1104E	57
12.7	3.0	-100	010-0105E	32	010-1105E	57
12.7	3.0	-150	010-0107E	32	010-1107E	57
12.7	3.0	-200	010-0108E	32	010-1108E	57
12.7	3.0	-250	010-0110E	32	010-1110E	57
12.7	3.0	-300	010-0111E	32	010-1111E	57
12.7	3.0	-400	010-0109E	32	010-1109E	57
12.7	3.0	-500	010-0115E	32	010-1115E	57
12.7	3.0	-1000	010-0120E	32	010-1120E	57
12.7	3.0	-1500	010-0123E	32	010-1123E	57
12.7	3.0	-2000	010-0125E	32	010-1125E	57
12.7	3.0	-3000	010-0130E	32	010-1130E	57
12.7	3.0	-4000	010-0140E	32	010-1140E	57
12.7	3.0	-5000	010-0150E	32	010-1150E	57
12.7	6.0	-25	010-0101T6	33	010-1101T6	58
12.7	6.0	-50	010-0103T6	33	010-1103T6	58
12.7	6.0	-75	010-0104T6	33	010-1104T6	58
12.7	6.0	-100	010-0105T6	33	010-1105T6	58
12.7	6.0	-150	010-0107T6	33	010-1107T6	58
12.7	6.0	-200	010-0108T6	33	010-1108T6	58
12.7	6.0	-250	010-0110T6	33	010-1110T6	58
12.7	6.0	-300	010-0111T6	33	010-1111T6	58
12.7	6.0	-400	010-0109T6	33	010-1109T6	58
12.7	6.0	-500	010-0115T6	33	010-1115T6	58
12.7	6.0	-1000	010-0120T6	33	010-1120T6	58
12.7	6.0	-1500	010-0123T6	33	010-1123T6	58
12.7	6.0	-2000	010-0125T6	33	010-1125T6	58
12.7	6.0	-3000	010-0130T6	33	010-1130T6	58
12.7	6.0	-4000	010-0140T6	33	010-1140T6	58
12.7	6.0	-5000	010-0150T6	33	010-1150T6	58

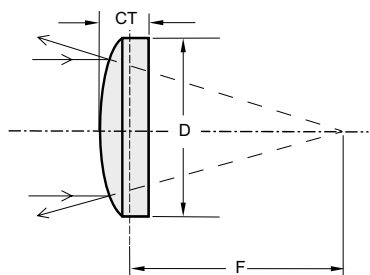
Diameter D, mm	Edge thickness ET, mm	ROC, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
25.4	6.0	-50	010-0201E	55	010-1201E	75
25.4	6.0	-75	010-0207E	55	010-1207E	75
25.4	6.0	-100	010-0202E	55	010-1202E	75
25.4	6.0	-125	010-0208E	55	010-1208E	75
25.4	6.0	-150	010-0203E	55	010-1203E	75
25.4	6.0	-200	010-0204E	55	010-1204E	75
25.4	6.0	-250	010-0205E	55	010-1205E	75
25.4	6.0	-300	010-0206E	55	010-1206E	75
25.4	6.0	-350	010-0211E	55	010-1211E	75
25.4	6.0	-400	010-0209E	55	010-1209E	75
25.4	6.0	-500	010-0210E	55	010-1210E	75
25.4	6.0	-600	010-0212E	55	010-1212E	75
25.4	6.0	-700	010-0214E	55	010-1214E	75
25.4	6.0	-750	010-0215E	55	010-1215E	75
25.4	6.0	-800	010-0216E	55	010-1216E	75
25.4	6.0	-900	010-0217E	55	010-1217E	75
25.4	6.0	-1000	010-0220E	55	010-1220E	75
25.4	6.0	-1500	010-0222E	55	010-1222E	75
25.4	6.0	-2000	010-0225E	55	010-1225E	75
25.4	6.0	-2500	010-0226E	55	010-1226E	75
25.4	6.0	-3000	010-0227E	55	010-1227E	75
25.4	6.0	-4000	010-0229E	55	010-1229E	75
25.4	6.0	-5000	010-0230E	55	010-1230E	75
25.4	6.0	-6000	010-0235E	55	010-1235E	75
25.4	6.0	-8000	010-0240E	65	010-1240E	80
25.4	6.0	-10000	010-0250E	65	010-1250E	80

Diameter D, mm	Edge thickness ET, mm	ROC, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
50.8	10.0	-100	010-0501E	110	010-1501E	210
50.8	10.0	-150	010-0508E	110	010-1508E	210
50.8	10.0	-200	010-0502E	110	010-1502E	210
50.8	10.0	-250	010-0503E	110	010-1503E	210
50.8	10.0	-300	010-0506E	110	010-1506E	210
50.8	10.0	-400	010-0504E	110	010-1504E	210
50.8	10.0	-500	010-0505E	110	010-1505E	210
50.8	10.0	-600	010-0507E	110	010-1507E	210
50.8	10.0	-750	010-0510E	110	010-1510E	210
50.8	10.0	-800	010-0511E	110	010-1511E	210
50.8	10.0	-1000	010-0515E	110	010-1515E	210
50.8	10.0	-1500	010-0518E	110	010-1518E	210
50.8	10.0	-2000	010-0520E	110	010-1520E	210
50.8	10.0	-2500	010-0521E	110	010-1521E	210
50.8	10.0	-3000	010-0522E	110	010-1522E	210
50.8	10.0	-4000	010-0524E	110	010-1524E	210
50.8	10.0	-5000	010-0525E	110	010-1525E	210
50.8	10.0	-6000	010-0530E	110	010-1530E	210
50.8	10.0	-8000	010-0540E	110	010-1540E	210
50.8	10.0	-10000	010-0550E	110	010-1550E	210

Diameter D, mm	Edge thickness ET, mm	ROC, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
76.2	12.7	-200	010-0705E	195	010-1705E	285
76.2	12.7	-300	010-0708E	195	010-1708E	285
76.2	12.7	-400	010-0710E	195	010-1710E	285
76.2	12.7	-500	010-0712E	195	010-1712E	285
76.2	12.7	-600	010-0714E	195	010-1714E	285
76.2	12.7	-800	010-0720E	195	010-1720E	285
76.2	12.7	-1000	010-0725E	195	010-1725E	285
76.2	12.7	-1500	010-0730E	195	010-1730E	285
76.2	12.7	-2000	010-0735E	195	010-1735E	285
76.2	12.7	-3000	010-0745E	195	010-1745E	285
101.6	15.0	-300	010-0808E	440	010-1808E	540
101.6	15.0	-400	010-0810E	440	010-1810E	540
101.6	15.0	-500	010-0812E	440	010-1812E	540
101.6	15.0	-600	010-0814E	440	010-1814E	540
101.6	15.0	-800	010-0820E	440	010-1820E	540
101.6	15.0	-1000	010-0825E	440	010-1825E	540
101.6	15.0	-1500	010-0830E	440	010-1830E	540
101.6	15.0	-2000	010-0835E	440	010-1835E	540
101.6	15.0	-3000	010-0845E	440	010-1845E	540

PLANO-CONVEX WINDOWS

Presented substrates are *uncoated*. For appropriate coating, please refer to the *Coatings Section*.



We provide a wide selection of shapes and sizes, with plano, spherical or cylindrical surfaces.

Diameter D, mm	Center thickness CT, mm	ROC, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
12.7	6.0	+50	011-0103E	34	011-1103E	60
12.7	6.0	+100	011-0105E	34	011-1105E	60
12.7	6.0	+150	011-0107E	34	011-1107E	60
12.7	6.0	+200	011-0108E	34	011-1108E	60
12.7	6.0	+300	011-0111E	34	011-1111E	60
12.7	6.0	+400	011-0113E	34	011-1113E	60
12.7	6.0	+500	011-0115E	34	011-1115E	60
25.4	6.0	+50	011-0201E	65	011-1201E	85
25.4	6.0	+75	011-0207E	65	011-1207E	85
25.4	6.0	+100	011-0202E	65	011-1202E	85
25.4	6.0	+150	011-0203E	65	011-1203E	85
25.4	6.0	+200	011-0204E	65	011-1204E	85
25.4	6.0	+300	011-0205E	65	011-1205E	85
25.4	6.0	+400	011-0206E	65	011-1206E	85
25.4	6.0	+500	011-0209E	65	011-1209E	85
25.4	6.0	+600	011-0210E	65	011-1210E	85
25.4	6.0	+800	011-0212E	65	011-1212E	85
25.4	6.0	+1000	011-0215E	65	011-1215E	85
25.4	6.0	+1500	011-0216E	65	011-1216E	85
25.4	6.0	+2000	011-0220E	65	011-1220E	85
25.4	6.0	+3000	011-0222E	65	011-1222E	85
25.4	6.0	+4000	011-0225E	65	011-1225E	85
25.4	6.0	+5000	011-0227E	65	011-1227E	85
50.8	10.0	+100	011-0502E	120	011-1502E	220
50.8	10.0	+150	011-0503E	120	011-1503E	220
50.8	10.0	+200	011-0504E	120	011-1504E	220
50.8	10.0	+300	011-0505E	120	011-1505E	220
50.8	10.0	+400	011-0506E	120	011-1506E	220
50.8	10.0	+500	011-0509E	120	011-1509E	220
50.8	10.0	+600	011-0510E	120	011-1510E	220
50.8	10.0	+800	011-0512E	120	011-1512E	220
50.8	10.0	+1000	011-0515E	120	011-1515E	220
50.8	10.0	+1500	011-0518E	120	011-1518E	220
50.8	10.0	+2000	011-0520E	120	011-1520E	220
50.8	10.0	+3000	011-0522E	120	011-1522E	220
50.8	10.0	+4000	011-0525E	120	011-1525E	220

HOUSING ACCESSORIES

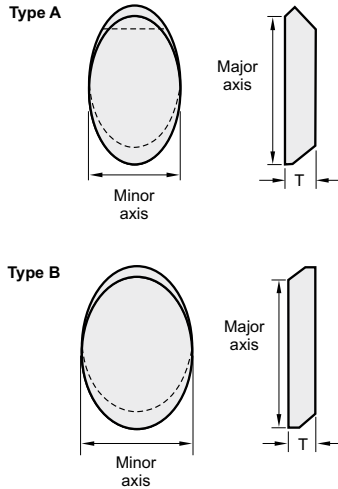
Kinematic Mirror
Mount 840-0020
Find more at EksmaOptics.com



ELLIPTICAL WINDOWS

FEATURES

- › Bend light at precise angles with minimum wave distortion



Elliptical windows bend light at precise angles with minimum wave distortion due to elongated major axis. Precision 45 degree elliptical flat mirrors are ideal for technical and astronomical applications.

SPECIFICATIONS

Material	BK7, UV FS
Surface Quality S1, S2	20 – 10 scratch & dig (MIL-PRF-13830B)
Surface Flatness S1, S2	$\lambda/4$ @ 633 nm
Axis Tolerance	+0.00 / -0.12 mm
Thickness Tolerance	± 0.25 mm
Parallelism	<3 min

Presented substrates are **uncoated**. For appropriate coating, please refer to the **Coatings Section**.

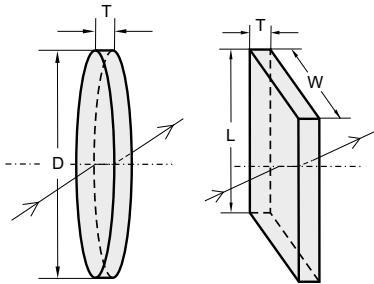
Material	Minor axis, mm	Major axis, mm	Thickness T, mm	Catalogue number	Price, EUR
BK7	18.0	25.0	3.0	020-0183	43
	25.0	35.0	4.0	020-0254	49
	30.0	42.5	4.0	020-0304	56
UV FS	18.0	25.0	3.0	020-1183	71
	25.0	35.0	4.0	020-1254	75
	30.0	42.5	4.0	020-1304	99

Please add letter A to the catalogue number for type A and letter B for type B. Contact us for other size or precision requirements.

FLAT WINDOWS

FEATURES

- › Have high transmittance, low wavefront distortion and low scatter
- › Are durable and strong
- › BK7 glass is an economical and ideal choice for high-quality visible applications
- › UV FS has the deepest UV range and the highest transmittance



Windows are used to allow optical radiation to pass from one environment to another without allowing other components of these environments to mix. Considerations in selecting windows may include transmission, scattering, wavefront distortion and resistance to certain environments. An ideal window allows an optical beam to pass from one medium to the next without changing the wavelength distribution of the beam, the transmitted wavefront or scatter any of the

light out of the beam. We offer windows made from three different materials, from which you may choose in view of the properties you need: BK7 or UV grade fused silica.

*Windows can be anti-reflection coated. For a required coating, please refer to the **Coatings Section**. Diameters of up to 250 mm are available on request.*

SPECIFICATIONS

Material	BK7, UV FS
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	>80% of the diameter
Diameter tolerance	+0.00 / -0.5 mm
Thickness tolerance	± 0.2 mm
Surface flatness	1 λ per inch @ 633 nm
Parallelism	2 arcmin

ROUND WINDOWS

HOUSING ACCESSORIES

Kinematic Mirror
Mount 840-0020

Find more at EksmaOptics.com



Diameter D, mm		Thickness T, mm	BK7		UV FS	
Metric	English		Catalogue number	Price, EUR	Catalogue number	Price, EUR
12.5	12.7	2.0	210-0102	9	210-1102	18
12.5	12.7	3.0	210-0103	10	210-1103	19
25.0	25.4	2.0	210-0202	15	210-1202	25
25.0	25.4	3.0	210-0203	16	210-1203	26
40.0	38.1	2.0	210-0402	23	210-1402	40
40.0	38.1	3.0	210-0403	24	210-1403	41
50.0	50.8	2.0	210-0502	28	210-1502	48
50.0	50.8	3.0	210-0503	29	210-1503	49
75.0	76.2	6.3	210-0703	90	210-1703	150

Please add letter M to the catalogue number for metric dimensions and letter E for English.

RECTANGULAR WINDOWS

HOUSING ACCESSORIES

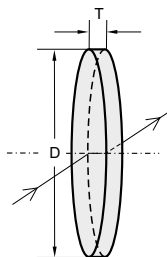
Rectangular Optics Holders
830-0100, 830-0110

Find more at EksmaOptics.com



Rectangular dimensions		Thickness T, mm	BK7		UV FS	
Width W, mm	Length L, mm		Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
15.0	20.0	2.0	215-0122	11	215-1122	20
25.4	25.4	2.0	215-0222	15	215-1222	25
20.0	30.0	2.0	215-0232	16	215-1232	26
25.4	50.8	2.0	215-0252	20	215-1252	32
50.8	50.8	2.0	215-0552	28	215-1552	48
50.8	50.8	6.3	215-0556	33	215-1556	53

PRECISION THIN ROUND WINDOWS



SPECIFICATIONS

Material	UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Clear aperture	>90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	±0.2 mm
Surface flatness	$\lambda/4$ or $\lambda/10$ @ 633 nm
Parallelism	<1 arcmin or <30 arcsec

HOUSING ACCESSORIES

Optical Component
Mount 830-0037

Find more at EksmaOptics.com



Plate Clamp 830-0055

Find more at EksmaOptics.com



Universal Plate Holder
830-0075

Find more at EksmaOptics.com



Diameter D, mm		Thickness T, mm	Flatness	Parallelism	Catalogue number	Price, EUR
Metric	English					
12.5	12.7	1.0	$\lambda/10$	30 arcsec	226-1111	60
12.5	12.7	2.0	$\lambda/10$	30 arcsec	226-1121	53
20.0	20.0	1.0	$\lambda/10$	30 arcsec	226-1191	75
20.0	20.0	2.0	$\lambda/10$	30 arcsec	226-1201	72
25.0	25.4	1.0	$\lambda/10$	30 arcsec	226-1211	80
25.0	25.4	2.0	$\lambda/10$	30 arcsec	226-1221	75
50.0	50.8	3.0	$\lambda/10$	30 arcsec	226-1531	165
12.5	12.7	1.0	$\lambda/4$	1 arcmin	226-1116	42
12.5	12.7	2.0	$\lambda/4$	1 arcmin	226-1126	38
25.0	25.4	1.0	$\lambda/4$	1 arcmin	226-1216	61
25.0	25.4	2.0	$\lambda/4$	1 arcmin	226-1226	55
50.0	50.8	1.0	$\lambda/4$	1 arcmin	226-1516	139
50.0	50.8	2.0	$\lambda/4$	1 arcmin	226-1526	131
50.0	50.8	3.0	$\lambda/4$	1 arcmin	226-1536	125

Please add letter M to the catalogue number for metric dimensions and letter E for English.

PRECISION WINDOWS

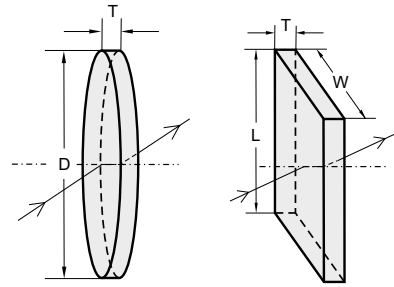
FEATURES

- Manufactured from the high quality UV FS and BK7
- Precision polished on both surfaces and held parallel up to 3 arcsec

These windows are designed to be used in precision optical systems. The optical transmission is high with little distortion of the transmitted signal. $\lambda/10$ transmitted wavefront distortion is usually preferred but $\lambda/4$ is offered as an option when this is not an issue.

Windows can be anti-reflection coated. For required coating, please refer to the **Coatings Section**. Diameters of up to 250 mm are available on request.

Please refer to the UV and IR Optics section for windows made from other materials: LiF, ZnSe, Ge, Sapphire, etc.



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Clear aperture	>90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	±0.2 mm
Surface flatness	$\lambda/4$ or $\lambda/10$ @ 633 nm
Parallelism	<1 arcmin, <30 arcsec or <3 arcsec

ROUND WINDOWS

Diameter D, mm		Thickness T, mm	Flatness	Parallelism	BK7		UV FS	
Metric	English				Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
12.5	12.7	3.0	$\lambda/10$	30 arcsec	220-0101	28	220-1101	43
12.5	12.7	6.0	$\lambda/10$	30 arcsec	220-0161	25	220-1161	40
20.0	20.0	3.0	$\lambda/10$	30 arcsec	220-0191	35	220-1191	45
20.0	20.0	5.0	$\lambda/10$	30 arcsec	220-0211	31	220-1211	43
25.0	25.4	3.0	$\lambda/10$	30 arcsec	220-0231	44	220-1231	57
25.0	25.4	6.0	$\lambda/10$	30 arcsec	220-0201	39	220-1201	49
40.0	38.1	6.0	$\lambda/10$	30 arcsec	220-0462	56	220-1462	80
40.0	38.1	8.0	$\lambda/10$	30 arcsec	220-0402	51	220-1402	90
50.0	50.8	6.0	$\lambda/10$	30 arcsec	220-0562	78	220-1562	125
50.0	50.8	8.0	$\lambda/10$	30 arcsec	220-0582	71	220-1582	120
50.0	50.8	10.0	$\lambda/10$	30 arcsec	220-0502	65	220-1502	145
75.0	76.2	12.7	$\lambda/10$	30 arcsec	220-0722	135	220-1722	225
75.0	76.2	15.0	$\lambda/10$	30 arcsec	220-0752	140	220-1752	235
101.6	100.0	15.0	$\lambda/10$	30 arcsec	220-0852	240	220-1852	450
12.5	12.7	3.0	$\lambda/10$	3 arcsec	220-0103	44	220-1103	62
12.5	12.7	6.0	$\lambda/10$	3 arcsec	220-0163	41	220-1163	56
12.5	12.7	10.0	$\lambda/10$	3 arcsec	220-0193	37	220-1193	50
25.0	25.4	6.0	$\lambda/10$	3 arcsec	220-0203	69	220-1203	94
25.0	25.4	10.0	$\lambda/10$	3 arcsec	220-0293	62	220-1293	84
40.0	38.1	10.0	$\lambda/10$	3 arcsec	220-0403	89	220-1403	139
50.0	50.8	12.0	$\lambda/10$	3 arcsec	220-0503	119	220-1503	185
12.5	12.7	3.0	$\lambda/4$	1 arcmin	220-0106	19	220-1106	34
12.5	12.7	6.0	$\lambda/4$	1 arcmin	220-0166	17	220-1166	31
25.0	25.4	3.0	$\lambda/4$	1 arcmin	220-0236	23	220-1236	40
25.0	25.4	6.0	$\lambda/4$	1 arcmin	220-0206	22	220-1206	35
40.0	38.1	6.0	$\lambda/4$	1 arcmin	220-0466	38	220-1466	75
40.0	38.1	8.0	$\lambda/4$	1 arcmin	220-0406	37	220-1406	85
50.0	50.8	6.0	$\lambda/4$	1 arcmin	220-0566	55	220-1566	120
50.0	50.8	8.0	$\lambda/4$	1 arcmin	220-0586	52	220-1586	115
75.0	76.2	8.0	$\lambda/4$	1 arcmin	220-0786	120	220-1786	210
75.0	76.2	12.7	$\lambda/4$	1 arcmin	220-0726	125	220-1726	215

Please add letter M to the catalogue number for metric dimensions and letter E for English.

HOUSING ACCESSORIES

Kinematic Mirror and Beamsplitter Mount 840-0030-02

Find more at
EksmaOptics.com



RECTANGULAR WINDOWS

Surface flatness: $\lambda/10$ @633nm. Parallelism: <30 arcsec

Rectangular dimensions		Thickness T, mm	BK7		UV FS	
Width W, mm	Length L, mm		Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
15.0	20.0	3.0	225-0123	45	225-1123	78
15.0	20.0	6.0	225-0126	40	225-1126	70
25.4	25.4	6.0	225-0226	43	225-1226	76
20.0	30.0	6.0	225-0236	46	225-1236	110
25.4	50.8	10.0	225-0250	59	225-1250	135
50.8	50.8	10.0	225-0550	83	225-1550	189

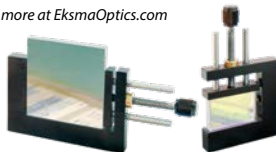
RELATED PRODUCTS

We offer AR Coated Precision Windows for Nd:YAG laser applications

See page 3.11

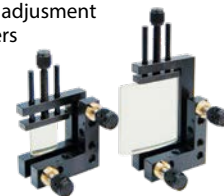
Rectangular Optics Holders
830-0100, 830-0110

Find more at [EksmaOptics.com](#)



For applications where fine adjustment
is required, use Prism Holders
840-0160, 840-0170

Find more at [EksmaOptics.com](#)



OPTICAL FLATS

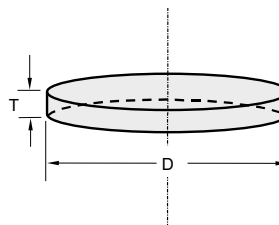
FEATURES

- Flatness of reference surface $\lambda/20$

Optical flats are used for testing and evaluating other optical elements. An interference pattern is formed in the air between the flat and object being evaluated, and this pattern is usually more easily seen through the flat than through the object. The pattern consists of alternating bright and dark bands or fringes which are a contour map of the thickness of the air film. If the surface of the optic is significantly flatter than the surface being evaluated, it is correct to interpret the interference pattern directly as a contour map of the surface being evaluated. If the flat is used on the top of the object, and the interference pattern viewed through the flat, it is advantageous to have an anti-

reflection coating on the top surface of the flat (the surface which does not touch the object being evaluated).

For an appropriate AR coating, please refer to the **Coatings Section** (see pages 1.5-1.6).



SPECIFICATIONS

Diameter D, mm		Thickness T, mm	Catalogue number	Price, EUR
Metric	English			
25.0	25.4	8.0	230-1208	112
40.0	38.1	10.0	230-1410	149

For metric dimensions please add to catalogue number letter M, for English – letter E.

Material	UV FS
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	± 0.2 mm
Surface flatness: 1st surface	$\lambda/20$ @ 633 nm
2nd surface	2λ @ 633 nm

CRYSTALLINE MATERIALS FOR OPTICAL UV BAND PASS FILTERS

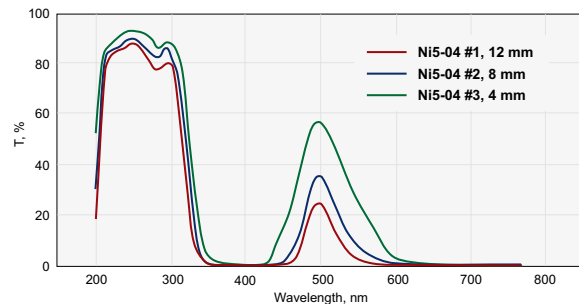
Almost all UV radiation (especially 240–280 nm) is absorbed by the Earth's ozone layer, and UV radiation that is created by some objects near the Earth surface can be detected only using special ozone filters.

Crystalline materials are robust substrates from which optical filters of high purity and optical homogeneity can be fabricated.

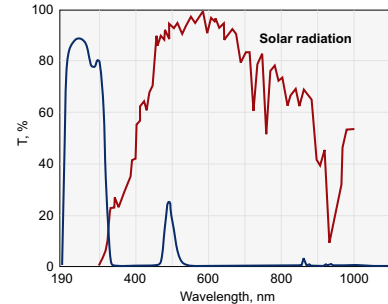
Available crystalline materials: $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ (NSH) and $\text{K}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ (KNSH).

Polished cylinders of $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ measuring up to $\varnothing 60 \times 40$ mm are available.

Polished cylinders of $\text{K}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ measuring up to $\varnothing 60 \times 40$ mm are available.



Typical spectral transmittance curves of different thickness $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ elements

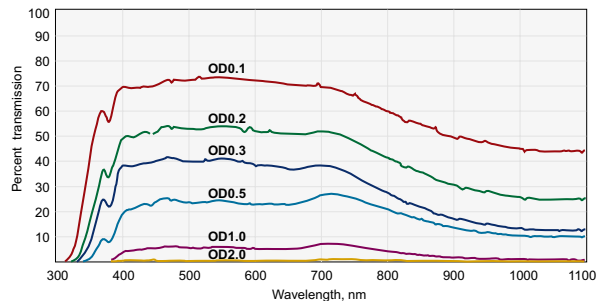


NEUTRAL DENSITY ABSORPTION TYPE FILTERS AT 450-650 nm

SPECIFICATIONS

Material	Neutral density colour glass
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Surface flatness	1λ per inch @ 633 nm
Parallelism	3 arcmin
Diameter tolerance	+0.0 / -0.2 mm
Clear aperture	90% of the diameter
Design wavelength	450 – 650 nm
Optical density tolerance	±5% of density

Neutral density absorption type filters decrease the intensity of light without altering the relative spectral distribution of energy. They are used to filter the entire visible spectrum evenly, allowing light reduction without influencing the colour or contrast. Attenuation is accomplished by using light-absorbing glass.



External transmission curves (include reflections from uncoated surfaces)

RELATED PRODUCTS

Variable Wheel Attenuator 990-0604

Find more at EksmaOptics.com

Filter Holder
830-0060A,
830-0070A

Find more at
EksmaOptics.com



Optical Density	Internal Transmittance, % @ 633 nm	Ø25.4 mm		25.4x25.4 mm		Ø50.8 mm		50.8x50.8 mm	
		Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
0.05	89	240-2500	21	240-2600	22	240-5000	56	240-5600	55
0.1	80	240-2501	21	240-2601	22	240-5001	56	240-5601	55
0.2	63	240-2502	21	240-2602	22	240-5002	56	240-5602	55
0.3	50	240-2503	21	240-2603	22	240-5003	56	240-5603	55
0.4	40	240-2504	21	240-2604	22	240-5004	56	240-5604	55
0.5	32	240-2505	21	240-2605	22	240-5005	56	240-5605	55
0.6	25	240-2506	21	240-2606	22	240-5006	56	240-5606	55
0.7	20	240-2507	21	240-2607	22	240-5007	56	240-5607	55
0.8	15	240-2508	21	240-2608	22	240-5008	56	240-5608	55
0.9	12.5	240-2509	21	240-2609	22	240-5009	56	240-5609	55
1.0	10	240-2510	21	240-2610	22	240-5010	56	240-5610	55
1.5	3	240-2515	21	240-2615	22	240-5015	56	240-5615	55
2.0	1	240-2520	22	240-2620	23	240-5020	57	240-5620	56
3.0	0.1	240-2530	23	240-2630	24	240-5030	58	240-5630	57
4.0	0.01	240-2540	24	240-2640	25	240-5040	59	240-5640	58

NEUTRAL DENSITY REFLECTIVE TYPE FILTERS AT 400-2000 NM

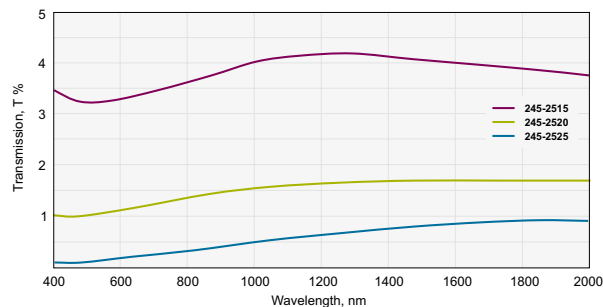
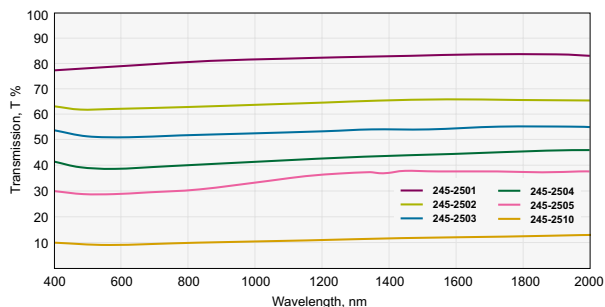
Neutral density reflective type filters of 1" (25.4 mm) size with optical density that varies from 0.1 to 2.5 are available.

Neutral density filters of Corning 7059 glass provide spectrally uniform attenuation from 400 nm to 2000 nm.

The reflective coatings enable to reduce thermal effects when these filters are used with moderate power lasers.

SPECIFICATIONS

Glass Material	Corning 7059 (Borosilicate)
Surface Quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Surface Flatness	λ @ 633 nm
Parallelism	<2 arcmin
Outer Diameter	25.4 mm +0.0/-0.2 mm
Thickness	1.1 mm $\pm$ 0.1 mm
Coating	Reflective
Laser Damage Threshold	20 mJ/cm ² (10 ns pulse)
Design Wavelength	400 – 2000 nm
Optical Density Tolerance	$\pm$ 10% Nominal



Optical Density	Transmission T, % @ 550 nm	Catalogue number	Price, EUR
0.1	79	245-2501	29
0.2	63	245-2502	29
0.3	50	245-2503	29
0.4	40	245-2504	29
0.5	32	245-2505	29
1.0	10	245-2510	29
1.5	3	245-2515	29
2.0	1	245-2520	29
2.5	0.3	245-2525	29

RELATED PRODUCTS

Plate Clamp 830-0055

Find more at [EksmaOptics.com](#)



Universal Plate Holder 830-0075

Find more at [EksmaOptics.com](#)



Variable Wheel Attenuator 990-0604-02

Find more at [EksmaOptics.com](#)



Filters Holder with 90° Flip 990-0400

See page 5.21



COLOR GLASS FILTERS

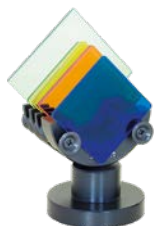
Color glass filters are made from optically polished highest quality Schott coloured optical glass. The spectral properties of these filters are uniform over the entire aperture and independent of the angle of incidence. Color glass filters can be used alone or in conjunction with monochromators or interference filters to isolate various spectral regions.

SPECIFICATIONS

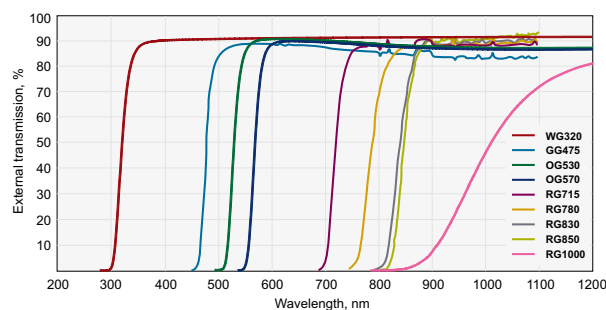
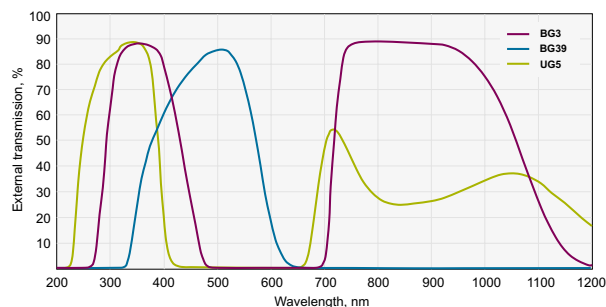
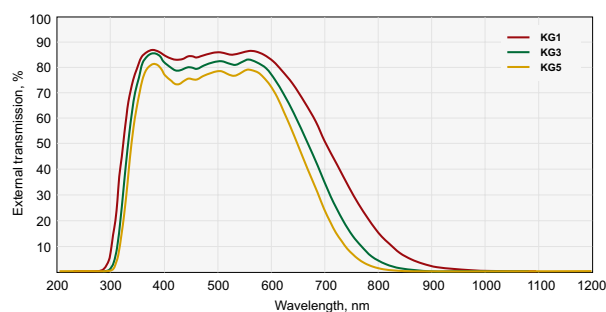
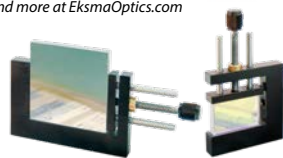
Material	Schott colour glass
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Surface flatness	1λ per inch @ 633 nm
Parallelism	3 arcmin
Diameter tolerance	+0.0 / -0.2 mm
Thickness	3.0 ± 0.2 mm
Clear aperture	90% of the diameter

RELATED PRODUCTS

Filter Holders
830-0070A
*Find more at
EksmaOptics.com*



Rectangular Optics Holders
830-0100, 830-0110
Find more at EksmaOptics.com



External transmission curves (include reflections from uncoated surfaces)

Material	Ø25.4 mm		25.4×25.4 mm		Ø50.8 mm		50.8×50.8 mm	
	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
BG3	241-2003	27	241-3003	26	241-5003	51	241-6003	53
UG5	241-2005	45	241-3005	44	241-5005	89	241-6005	88
BG39	241-2039	32	241-3039	31	241-5039	63	241-6039	62
KG1	242-2001	24	242-3001	23	242-5001	47	242-6001	46
KG3	242-2003	27	242-3003	26	242-5003	51	242-6003	50
KG5	242-2005	28	242-3005	27	242-5005	52	242-6005	51
WG320	243-2320	24	243-3320	23	243-5320	47	243-6320	46
GG475	243-2475	24	243-3475	23	243-5475	47	243-6475	46
OG530	243-2530	24	243-3530	23	243-5530	47	243-6530	46
OG570	243-2570	24	243-3570	23	243-5570	47	243-6570	46
RG715	243-2715	24	243-3715	23	243-5715	47	243-6715	46
RG780	243-2780	28	243-3780	27	243-5780	52	243-6780	51
RG830	243-2830	28	243-3830	27	243-5830	52	243-6830	51
RG850	243-2850	28	243-3850	27	243-5850	52	243-6850	51
RG1000	243-2990	24	243-3990	23	243-5990	47	243-6990	46

LASER SAFETY EYEWEAR

FEATURES

- › Wide spectrum of visibility
- › Comfort and universal fit
- › For Nd:YAG, Yb:KGW/KYW, Ti:sapphire applications



251-1064 Goggles

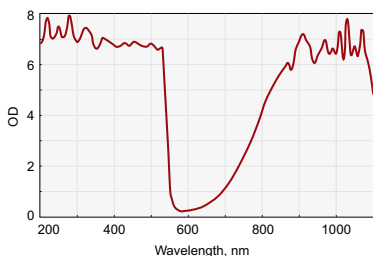


250-0800 Spectacles

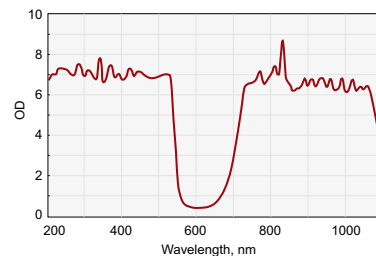
EKSMA OPTICS offers two different kinds of laser safety eyewear in two different styles: spectacles and goggles. The eyewear are amber colour and suitable for safe operation with Nd:YAG, Ti:Sapphire, Yb:KGW/KYW fundamental, second, third, fourth harmonics.

The eyewear absorbs laser radiation and gives perfect visibility. Both goggles and spectacles can be worn on prescription glasses. The goggles have air vents that prevent fogging. Laser beam cannot pass through the air vents. Goggles and spectacles come with protective case.

The models match the requirements for health and protection mentioned in the Directive of the European Community on Personal Protective Equipment (PPE) 89/686/EEC.



Nd:YAG and Harmonics, VLT 24%



Nd:YAG + Ti:Sapphire and Harmonics, VLT 11%

250-1064, 251-1064

Wavelength, nm	Optical Density
190–534	6.5+
910–1070	6+
870–1070	5+

250-0800, 251-0800

Wavelength, nm	Optical Density
190–534	6+
720–1064	5+
740–1064	5+

Description	Catalogue number	Price, EUR
Spectacles for Nd:YAG + Ti:Sapphire applications	250-0800	170
Goggles for Nd:YAG + Ti:Sapphire applications	251-0800	170
Spectacles for Nd:YAG applications	250-1064	150
Goggles for Nd:YAG applications	251-1064	150

VISUALIZATORS

VISUALIZATOR WITH A HOLDER

FEATURES

- › Produces a diffused second-harmonic reflection (visible) from an infrared (invisible) beam
- › High mechanical durability
- › High sensitivity to laser radiation
- › Damage threshold for pulse laser – 1 J/cm², 10 ns
- › Damage threshold for CW laser – 400 W/cm²

Laser Beam Visualizer 990-0840 is used for visualization of CW or pulsed laser radiation with wavelength 880 – 1070 nm. When CW or pulsed laser radiation of wavelength 880 – 1070 nm falls onto the working surface, the latter glows in the second harmonic of the beam. Use this item to adjust and check a shape of a laser beam. It helps to see the structure of a laser beam intensity distribution. Working surface diameter – 35 mm.

Laser Beam Visualizer 990-0841 visualize IR and UV coherent and incoherent radiation from various light sources, lasers and others. Made of rare-earth materials, it is an eco-friendly ceramic tablet.

Laser Beam Visualizer 990-0842 combines 990-0840 and 990-0841 in one for user convenience. One side visualizes radiation with wavelength 190-1600 nm by emitting red color and the other side visualizes radiation with 880-1070 nm by emitting green color.



990-0840

Spectral range, nm	Emitted light colour	Threshold sensitivity, W/cm ²	Catalogue number	Price, EUR
880 – 1070	Green	0.02	990-0840	80
190 – 1090 + 1470 – 1600	Red	0.01	990-0841	99
190 – 1090 + 1470 – 1600 / 880 – 1070	Red / Green	0.01 / 0.02	990-0842	155

Mirrors

COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

LASER MIRRORS

Laser mirrors are dielectric reflectors providing an optimised performance at stated wavelengths. High polishing quality is important for low wave front distortion, low scattering and high laser damage threshold. Mirrors are designed to work at 0 or 45 degrees.

SUBSTRATE

Material	UV grade fused silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20 – 10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm / -0.12 mm
Thickness Tolerance	± 0.25 mm
Wedge	< 3 min
Chamfer	0.3 mm at 45° typical

COATING

Technology	Electron beam multilayer dielectric or Ion beam sputtering
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Coated Surface Flatness	$\lambda/10$ at 633 nm over 85% of diameter available
Angle of Incidence	0 or 45°

LASER LINE MIRRORS

Substrate material: BK7, grade A. AOI = 45°. Laser damage threshold: 6 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Ø12.7 × 3 mm	Ø12.7 × 6 mm	Price, EUR	Ø25.4 × 6 mm		Ø50.8 × 8 mm	
			Catalogue nr.			Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
351 – 361	Nd:YAG 3H	99.5	031-0350	031-0350T6	59	032-0350	90	035-0350	128
380 – 420	Ti: Sa 2H	99.5	031-0400	031-0400T6	57	032-0400	89	035-0400	133
442	HeCd	99.5	031-0442	031-0442T6	57	032-0442	83	035-0442	133
488 – 515	Ar+	99.5	031-0490	031-0490T6	57	032-0490	83	035-0490	133
500 – 530	Yb:KGW/KYW 2H	99.5	031-0515	031-0515T6	56	032-0515	74	035-0515	110
527 – 532	Nd:YAG 2H	99.5	031-0530	031-0530T6	56	032-0530	74	035-0530	110
589	Dye	99.5	031-0590	031-0590T6	56	032-0590	82	035-0590	122
633 – 670	HeNe+Diode	99.5	031-0630	031-0630T6	56	032-0630	75	035-0630	122
694	Ruby	99.5	031-0694	031-0694T6	56	032-0694	75	035-0694	122
760 – 840	Ti:Sa 1H	99.5	031-0800	031-0800T6	61	032-0800	85	035-0800	133
780	Diode	99.5	031-0780	031-0780T6	57	032-0780	83	035-0780	122
852	Diode	99.5	031-0850	031-0850T6	57	032-0850	83	035-0850	133
980	Diode	99.5	031-0980	031-0980T6	57	032-0980	83	035-0980	122
1000 – 1060	Yb:KGW/KYW 1H	99.5	031-1030	031-1030T6	57	032-1030	75	035-1030	110
1047 – 1064	Nd:YAG 1H	99.5	031-1060	031-1060T6	57	032-1060	75	035-1060	110
1300 – 1320	YAG	99.5	031-1300	031-1300T6	61	032-1300	85	035-1300	137
1520 – 1570	Diode	99.5	031-1550	031-1550T6	61	032-1550	90	035-1550	139

Mirrors provided are of AOI=45°. Mirrors with AOI=0° can be ordered by adding -i0 to catalogue number. Reflectivity R (s+p)/2 for AOI=0° is 99.8%.

The examples:
031-0350-i0, 037-0400-i0.

BK7 Ø76.2×12.7 mm. AOI = 45°. Laser damage threshold: 6 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Catalogue number	Price, EUR
380 – 420	Ti: Sa 2H	99.5	037-0400	199
500 – 530	Yb:KGW/KYW 2H	99.5	037-0515	185
527 – 532	Nd:YAG 2H	99.5	037-0530	185
760 – 840	Ti: Sa 1H	99.5	037-0800	199
1000 – 1060	Yb:KGW/KYW 3H	99.5	037-1030	185
1047 – 1064	Nd:YAG 1H	99.5	037-1060	185

Substrate material: UV grade Fused Silica. AOI = 45°. Laser damage threshold: 6 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Ø12.7 × 3 mm	Ø12.7 × 6 mm	Ø12.7 mm	Ø25.4 × 6 mm		Ø50.8 × 8 mm	
			Catalogue nr.		Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
244 – 248	KrF	99.0	041-0240	041-0240T6	71	042-0240	99	045-0240	216
262 – 266	Nd:YAG	99.0	041-0260	041-0260T6	71	042-0260	99	045-0260	207
257 – 275	Ti:Sa 3H	99.0	041-0266	041-0266T6	71	042-0266	99	045-0266	207
308	XeCl	99.2	041-0300	041-0300T6	69	042-0300	97	045-0300	207
325	HeCd	99.5	041-0325	041-0325T6	67	042-0325	95	045-0325	181
333 – 353	Yb:KGW/KYW 3H	99.5	041-0343	041-0343T6	77	042-0343	107	045-0343	187
347	Ruby	99.5	041-0347	041-0347T6	67	042-0347	95	045-0347	181
351 – 361	Nd:YAG 3H	99.5	041-0350	041-0350T6	67	042-0350	95	045-0350	187
		99.9	–	041-0350T6HHR	110	042-0350HHR	130	045-0350T12HHR*	460
380 – 420	Ti:Sa 2H	99.5	041-0400	041-0400T6	67	042-0400	95	045-0400	181
500 – 530	Yb:KGW/KYW 2H	99.5	041-0515	041-0515T6	62	042-0515	90	045-0515	169
527 – 532	Nd:YAG 2H	99.5	041-0530	041-0530T6	62	042-0530	90	045-0530	169
		99.9	–	041-0530T6HHR	75	042-0530HHR	105	045-0530T12HHR*	410
760 – 840	Ti:Sa 1H	99.5	041-0800	041-0800T6	75	042-0800	97	045-0800	181
		99.9	–	041-0800T6HHR	108	042-0800HHR	130	045-0800T12HHR*	440
1000 – 1060	Yb:KGW/KYW 1H	99.5	041-1030	041-1030T6	62	042-1030	90	045-1030	169
		99.9	–	041-1030T6HHR	75	042-1030HHR	105	045-1030T12HHR*	410
1047 – 1064	Nd:YAG 1H	99.5	041-1060	041-1060T6	62	042-1060	90	045-1060	169
		99.9	–	041-1060T6HHR	75	042-1060HHR	105	045-1060T12HHR*	410

* Thickness of Ø50.8 HHR mirrors is 12.0 mm.

Mirrors provided are of AOI=45°. Mirrors with AOI=0° can be ordered by adding -i0 to catalogue number. Reflectivity R (s+p)/2 for AOI=0° is 99.8%.

The examples:
042-0240-i0, 047-0266-i0.

Substrate material: UV grade Fused Silica Ø76.2x12.7 mm.

AOI = 45°. Laser damage threshold: 6 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Catalogue number	Price, EUR
257 – 275	Ti:Sa 3H	99.0	047-0266	315
333 – 353	Yb:KGW/KYW 3H	99.5	047-0343	315
351 – 361	Nd:YAG 3H	99.5	047-0350	315
380 – 420	Ti:Sa 2H	99.5	047-0400	315
500 – 530	Yb:KGW/KYW 2H	99.5	047-0515	315
527 – 532	Nd:YAG 2H	99.5	047-0530	315
760 – 840	Ti:Sa 1H	99.5	047-0800	315
1000 – 1060	Yb:KGW/KYW 1H	99.5	047-1030	315
1047 – 1064	Nd:YAG 1H	99.5	047-1060	315

DUAL BAND MIRRORS

Substrate: BK7, grade A. AOI = 45°. Laser damage threshold: 1 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Ø12.7 × 3 mm	Ø12.7 × 6 mm	Ø12.7	Ø25.4 × 6 mm		Ø50.8 × 8 mm		Ø76.2 × 12.7 mm	
			Catalogue number		Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
390 – 410 + 780 – 820	Ti:Sa 2H+1H	99.5	051-4080	051-4080T6	85	052-4080	103	055-4080	151	057-4080	227
500 – 530 + 1000 – 1060	Yb:KGW/KYW 2H+1H	99.5	051-5103	051-5103T6	85	052-5103	103	055-5103	151	057-5103	227
532 + 1064	Nd:YAG 2H+1H	99.5	051-5306	051-5306T6	85	052-5306	103	055-5306	151	057-5306	227
633 + 1064	HeNe:Nd:YAG 1H	99.5	051-6306	051-6306T6	85	052-6306	103	055-6306	151	057-6306	227

Mirrors provided are of AOI=45°. Mirrors with AOI=0° can be ordered by adding -i0 to catalogue number. The price remains the same as for AOI=45°. An example: 042-4080-i0.

Substrate material: UV grade Fused Silica. AOI = 45°. Laser damage threshold: 2 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Ø12.7 × 3 mm	Ø12.7 × 6 mm	Ø12.7	Ø25.4 × 6 mm		Ø50.8 × 8 mm		Ø76.2 × 12.7 mm	
			Catalogue number		Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
266 + 355	Nd:YAG 4H+3H	99.0	061-2635	061-2635T6	125	062-2635	149	065-2635	230	067-2635	365
266 + 532	Nd:YAG 4H+2H	99.0	061-2653	061-2653T6	125	062-2653	149	065-2653	230	067-2653	365
355 + 532	Nd:YAG 3H+2H	99.5	061-3553	061-3553T6	115	062-3553	139	065-3553	215	067-3553	323
355 + 1064	Nd:YAG 3H+1H	99.0	061-3506	061-3506T6	115	062-3506	139	065-3506	215	067-3506	323
390-410 + 780-820	Ti:Sa 2H+1H	99.5	061-4080	061-4080T6	110	062-4080	128	065-4080	214	067-4080	321
500-530 + 1000-1060	Yb:KGW/KYW 2H+1H	99.5	061-5103	061-5103T6	110	062-5103	128	065-5103	214	067-5103	321
532 + 1064	Nd:YAG 2H+1H	99.5	061-5306	061-5306T6	109	062-5306	134	065-5306	209	067-5306	318
		99.9	–	–	–	062-5306HHR	180	–	–	–	–
633 + 1064	HeNe:Nd:YAG 1H	99.5	061-6306	061-6306T6	109	062-6306	134	065-6306	209	067-6306	318

Mirrors provided are of AOI=45°. Mirrors with AOI=0° can be ordered by adding -i0 to catalogue number. The price remains the same as for AOI=45°. An example: 062-3553-i0.

BROADBAND LASER MIRRORS

Substrate: BK7, grade A. AOI = 45°. Laser damage threshold: 1 J/cm², 8 nsec pulse, 1064 nm typical.

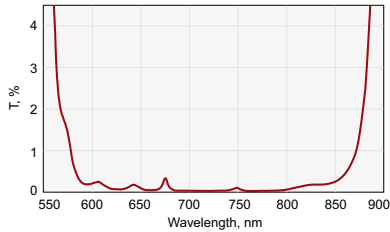
Wavelength, nm	Application	R, % (s+p)/2	Ø12.7 × 3 mm	Ø12.7 × 6 mm	Ø12.7	Ø25.4 × 6 mm		Ø50.8 × 8 mm	
			Catalogue number		Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
360 – 440	Ti:Sa 2H	99	071-3644	071-3644T6	89	072-3644	107	075-3644	151
420 – 540	Dye	99	071-4254	071-4254T6	85	072-4254	103	075-4254	145
520 – 650	Dye	99	071-5265	071-5265T6	85	072-5265	103	075-5265	145
600 – 850	Diode	99	071-6085	071-6085T6	85	072-6085	103	075-6085	145
730 – 950	Ti:Sa	99	071-7395	071-7395T6	86	072-7395	104	075-7395	147
800 – 1100	Diode,YAG	99	071-8011	071-8011T6	86	072-8011	104	075-8011	147

Mirrors provided are of AOI=45°. Mirrors with AOI=0° can be ordered by adding -i0 to catalogue number. The price remains the same as for AOI=45°. An example: [072-3644-i0](#).

Substrate: UV grade Fused Silica. AOI = 45°. Laser damage threshold: 1 J/cm², 8 nsec pulse, 1064 nm typical.

Wavelength, nm	Application	R, % (s+p)/2	Ø12.7 × 3 mm	Ø12.7 × 6 mm	Ø12.7	Ø25.4 × 6 mm		Ø50.8 × 8 mm	
			Catalogue number		Price, EUR	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
220 – 250	Spectroscopy	99	081-2225	081-2225T6	145	082-2225	165	085-2225	264
260 – 380	Spectroscopy	99	081-2638	081-2638T6	135	082-2638	155	085-2638	249
360 – 440	Ti:Sa 2H	99	081-3644	081-3644T6	115	082-3644	139	085-3644	215
420 – 540	Dye	99	081-4254	081-4254T6	110	082-4254	128	085-4254	214
520 – 650	Dye	99	081-5265	081-5265T6	110	082-5265	128	085-5265	214
600 – 850	Diode	99	081-6085	081-6085T6	110	082-6085	128	085-6085	214
730 – 950	Ti:Sa	99	081-7395	081-7395T6	130	082-7395	148	085-7395	234
800 – 1100	Diode, YAG	99	081-8011	081-8011T6	120	082-8011	138	085-8011	224

Mirrors provided are of AOI=45°. Mirrors with AOI=0° can be ordered by adding -i0 to catalogue number. The price remains the same as for AOI=45°. An example: [082-2225-i0](#).



071-6085. HR > 99% @ 600-850 nm

RELATED PRODUCTS

Broadband Low GDD
Ultrafast Laser Mirrors
See page 4.5

Kinematic
Mirror/Beamsplitter
Mounts 840-0056
Find more at [EksmaOptics.com](#)

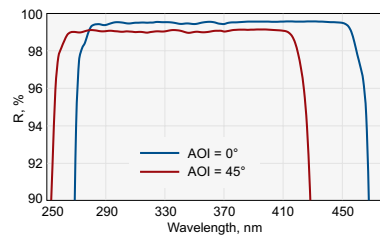


UV FS BROADBAND AND LASER LINE MIRRORS FOR AOI FROM 0 TO 45°

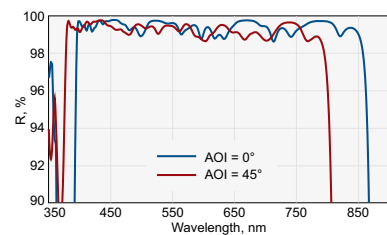
FEATURES

- $R_{avg} > 99\%$ for (s+p)/2 polarization that operates at all angles of incidence from 0 to 45°

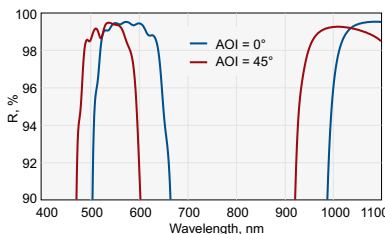
EKSMA OPTICS introduces broadband and laser line dielectric mirrors with high reflectance (greater than 99% over specified range minimum) that operate at all angles of incidence from 0° to 45°. Broadband and laser line mirrors are available for 280-400 nm, 349-355 nm, 400-750 nm, 524-532 nm, 532+1064 nm, 750-1100 nm, 1047-1064 nm wavelength ranges.



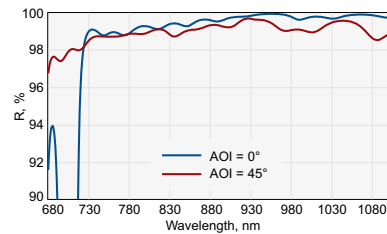
081-2840-i0-45.
HR > 99% @ 280-400 nm, AOI from 0 to 45°



081-4075-i0-45.
HR > 99% @ 400-750 nm, AOI from 0 to 45°



062-5306HHR-i0-45.
HR > 99.7% @ 532+1064 nm, AOI from 0 to 45°



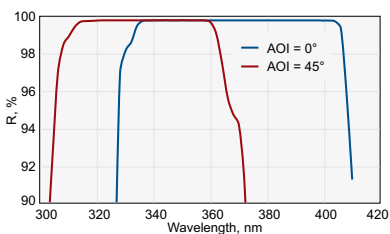
081-7511-i0-45.
HR > 99% @ 750-1100 nm, AOI from 0 to 45°

Substrate: UV grade Fused Silica

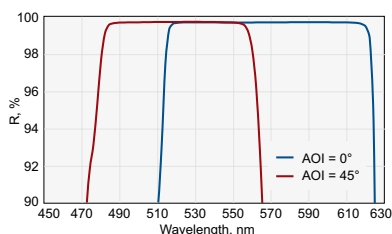
Wavelength, nm	AOI, deg	R, % (s+p)/2	LDT, J/cm ² 10 ns, 10 Hz	Ø12.7 × 6 mm		Ø25.4 × 6 mm		Ø50.8 × 6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
257	0-45	99.0	0.5	041-0257-i0-45	130	042-0257-i0-45	165	–	–
280 – 400	0-45	99.0	0.5	086-2840-i0-45	77	082-2840-i0-45	98	–	–
343 – 355	0-45	99.5	1	041-0350-i0-45	99	042-0350-i0-45	121	–	–
400 – 750	0-45	99.0	1	086-4075-i0-45	42	082-4075-i0-45	65	085-4075-i0-45	124
524 – 532	0-45	99.9	10	041-0530HHR-i0-45	90	042-0530HHR-i0-45	120	–	–
532 + 1064	0-45	99.7	3	061-5306HHR-i0-45	95	062-5306HHR-i0-45	125	–	–
750 – 1100	0-45	99.0	1	086-7511-i0-45	42	082-7511-i0-45	65	085-7511-i0-45	124
760 – 840 Low GDD	0-45	99.9	3	041-7684HHR-i0-45	110	042-7684HHR-i0-45	140	–	–
1047 – 1064	0-45	99.7	20	041-1060HHR-i0-45	90	042-1060HHR-i0-45	120	–	–

Substrate: BK7

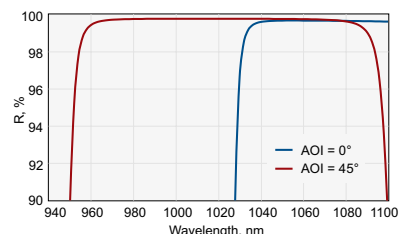
Wavelength, nm	AOI, deg	R, % (s+p)/2	LDT, J/cm ² 10 ns, 10 Hz	Ø12.7 × 6 mm		Ø25.4 × 6 mm		Ø50.8 × 6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
400 – 750	0-45	99.0	1	076-4076-i0-45	38	072-4075-i0-45	59	075-4075-i0-45	112
750 – 1100	0-45	99.0	1	076-7511-i0-45	38	072-7511-i0-45	59	075-7511-i0-45	112



042-0350-i0-45.
HR>99.5% @ 343-355 nm, AOI from 0 to 45°



042-0530HHR-i0-45.
HR>99.9% @ 524-532 nm, AOI from 0 to 45°



042-1060HHR-i0-45.
HR>99.7% @ 1047-1064 nm, AOI from 0 to 45°

HOUSING ACCESSORIES

Kinematic Mirror
Mount 840-0010
[Find more at EksmaOptics.com](#)



Adapter for Mirror
at 45° 840-0115
[Find more at EksmaOptics.com](#)



HIGH POWER IBS COATED LASER MIRRORS

SUBSTRATE

Material	UV grade fused silica
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20 – 10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm / -0.12 mm
Thickness Tolerance	± 0.25 mm
Wedge	< 3 min
Chamfer	0.3 mm at 45° typical

COATING

Technology	Ion Beam Sputtering (IBS)
Adhesion and Durability	Per MIL-C-675A, Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture

FOR NANOSECOND APPLICATIONS

Design wavelength – 532 nm. LIDT >10 J/cm², 10 ns pulse, 100 Hz, 532 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
532	45	99.9	041-0530T6HHR	75	042-0530HHR	105	045-0530T12HHR	410
532	0	99.9	041-0530T6HHR-i0	75	042-0530HHR-i0	105	045-0530T12HHR-i0	410
532	0-45	99.9	041-0530T6HHR-i0-45	90	042-0530HHR-i0-45	120	045-0530T12HHR-i0-45	470

Design wavelength – 532 nm. LIDT >20 J/cm², 10 ns pulse, 100 Hz, 532 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
532	45	99.9	041-0530T6UHHR	110	042-0530UHHR	155	045-0530T12UHHR	530
532	0	99.9	041-0530T6UHHR-i0	110	042-0530UHHR-i0	155	045-0530T12UHHR-i0	530

Design wavelength – 800 nm. LIDT >30 J/cm², 10 ns pulse, 100 Hz, 800 nm typical.

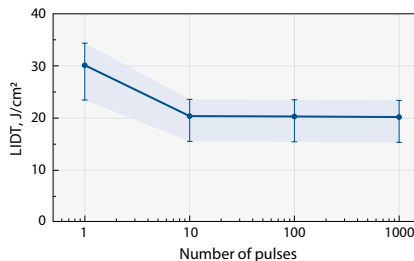
Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
800	45	99.9	041-0800NT6UHHR	115	042-0800NUHHR	165	045-0800NT12UHHR	550
800	0	99.9	041-0800NT6UHHR-i0	115	042-0800NUHHR-i0	165	045-0530T12UHHR-i0	550

Design wavelength – 1064 nm. LIDT >20 J/cm², 10 ns pulse, 100 Hz, 1064 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	45	99.9	041-1060T6HHR	75	042-1060HHR	105	045-1060T12HHR	410
1064	0	99.9	041-1060T6HHR-i0	75	042-1060HHR-i0	105	045-1060T12HHR-i0	410
1064	0-45	99.9	041-1060T6HHR-i0-45	90	042-1060HHR-i0-45	120	045-1060T12HHR-i0-45	470

Design wavelength – 1064 nm. LIDT >40 J/cm², 10 ns pulse, 100 Hz, 1064 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	45	99.9	041-1060NT6UHHR	115	042-1060NUHHR	165	045-1060NT12UHHR	550
1064	0	99.9	041-1060NT6UHHR-i0	115	042-1060NUHHR-i0	165	045-1060T12UHHR-i0	550



LIDT of High Power Laser Mirrors @ 532 nm

TEST CONDITIONS:

Wavelength	532 nm
Pulse duration	(5.4 ± 0.3) ns
Repetition rate	100 Hz
AOI	45°
Polarization	linear P
Beam diameter (1/e ²)	(206.0 ± 6.7) µm

FOR PICOSECOND APPLICATIONS

Design wavelength – 515 nm. LIDT >1 J/cm², 10 ps pulse, 20 kHz, 515 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
515	45	99.9	041-0515PHR	75	042-0515PHR	105	045-0515PHR	410
515	0	99.9	041-0515PHR-i0	75	042-0515PHR-i0	105	045-0515PHR-i0	410
515	0-45	99.9	041-0515PHR-i0-45	90	042-0515PHR-i0-45	120	045-0515PHR-i0-45	470

Design wavelength – 515 nm. LIDT >2.5 J/cm², 10 ps pulse, 20 kHz, 515 nm typical.

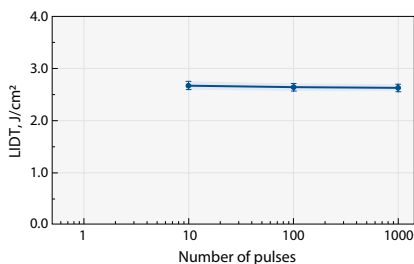
Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
515	45	99.9	041-0515PUHR	110	042-0515PUHR	105	045-0515PUHR	530
515	0	99.9	041-0515PUHR-i0	110	042-0515PUHR-i0	105	045-0515PUHR-i0	530

Design wavelength – 1030 nm. LIDT >1.5 J/cm², 10 ps pulse, 20 kHz, 1030 nm typical.

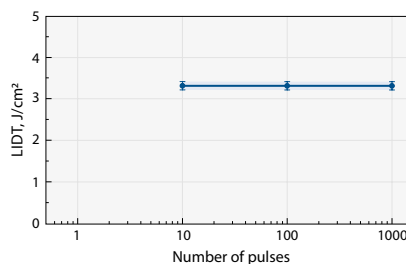
Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	45	99.9	041-1030PHR	75	042-1030PHR	105	045-1030PHR	410
1030	0	99.9	041-1030PHR-i0	75	042-1030PHR-i0	105	045-1030PHR-i0	410
1030	0-45	99.9	041-1030PHR-i0-45	90	042-1030PHR-i0-45	120	045-1030PHR-i0-45	470

Design wavelength – 1030 nm. LIDT >3 J/cm², 10 ps pulse, 20 kHz, 515 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	45	99.9	041-1030PUHR	115	042-1030PUHR	165	045-1030PUHR	550
1030	0	99.9	041-1030PUHR-i0	115	042-1030PUHR-i0	165	045-1030PUHR-i0	550



LIDT of High Power Laser Mirrors @ 515 nm



LIDT of High Power Laser Mirrors @ 1030 nm

FOR FEMTOSECOND APPLICATIONS

Design wavelength – 500-530 nm. LIDT >0.15 J/cm², 50 fs pulse, 100 Hz, 515 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
500 – 530	45	99.9	041-0515T6HHR	75	042-0515T6HHR	105	045-0515T12HHR	410
500 – 530	0	99.9	041-0515T6HHR-i0	75	042-0515T6HHR-i0	105	045-0515T12HHR-i0	410

Design wavelength – 760-840 nm. LIDT >0.15 J/cm², 50 fs pulse, 100 Hz, 800 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
760 – 840	45	99.9	041-0800T6HHR	108	042-0800HHR	130	045-0800T12HHR	440
760 – 840	0	99.9	041-0800T6HHR-i0	108	042-0800HHR-i0	130	045-0800T12HHR-i0	440
760 – 840	0-45	99.9	041-7684T6HHR-i0-45	110	042-7684HHR-i0-45	140	045-4684T12HHR-i0-45	480

Design wavelength – 760-840 nm. LIDT >0.4 J/cm², 50 fs pulse, 100 Hz, 800 nm typical.

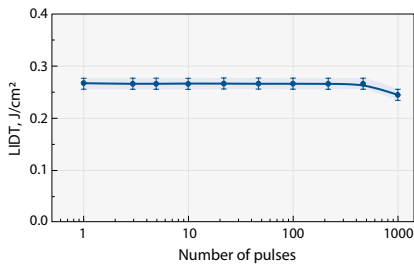
Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
760 – 840	45	99.9	041-0800T6UHHR	158	042-0800T6UHHR	190	045-0800T12UHHR	570
760 – 840	0	99.9	041-0800T6UHHR-i0	158	042-0800T6UHHR-i0	190	045-0800T12UHHR-i0	570

Design wavelength – 720-880 nm. LIDT >0.25 J/cm², 50 fs pulse, 100 Hz, 800 nm typical.

Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm		Ø 76.2 x 15 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
720 – 880	45	99.9	081-7288HHR	108	082-7288HHR	145	085-7288HHR	490	087-7288T15HHR	515
720 – 880	0	99.9	081-7288HHR-i0	108	082-7288HHR-i0	145	085-7288HHR-i0	490	087-7288T15HHR-i0	515

Design wavelength – 1000-1060 nm. LIDT >0.3 J/cm², 50 fs pulse, 100 Hz, 1030 nm typical.

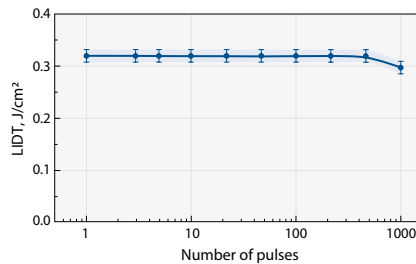
Wavelength, nm	AOI, deg	R, % (s+p)/2	Ø 12.7 x 6 mm		Ø 25.4 x 6 mm		Ø 50.8 x 12 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1000 – 1060	45	99.9	041-1030T6HHR	75	042-1030HHR	105	045-1030HHR	410
1000 – 1060	0	99.9	041-1030T6HHR-i0	75	042-1030HHR-i0	105	045-1030HHR-i0	410



LIDT of High Power Laser Mirrors
@ 720-880 nm, AOI = 45°

TEST CONDITIONS:

Wavelength	800 nm
Pulse duration	52.4 fs
Repetition rate	50 Hz
AOI	45°
Polarization	linear P
Beam diameter (1/e²)	(95.5 ± 0.9) µm



LIDT of High Power Laser Mirrors
@ 720-880 nm, AOI = 0°

TEST CONDITIONS:

Wavelength	800 nm
Pulse duration	52.4 fs
Repetition rate	50 Hz
AOI	0°
Polarization	linear
Beam diameter (1/e²)	(95.5 ± 0.9) µm

DICHROIC MIRRORS

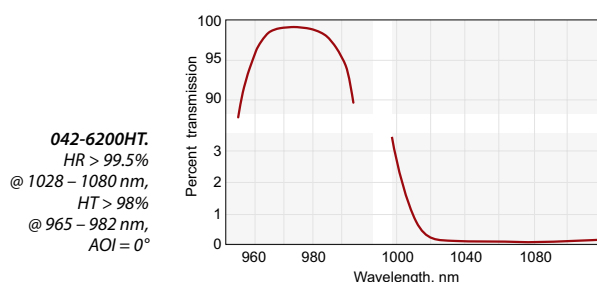
FEATURES

- Laser Damage Threshold:
> 2 J/cm², 8 ns pulse, 1064 nm typical for BK7 substrates
> 5 J/cm², 8 ns pulse, 1064 nm typical for UV FS substrates
- Back side antireflection coated: R < 0.5%
- Parallelism: 30 arcsec

SUBSTRATE

Material	UV grade fused silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20 – 10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	$\lambda/10$ typical at 633 nm
S2 Surface Quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm / -0.12 mm
Thickness Tolerance	±0.25 mm
Parallelism	30 arcsec
Chamfer	0.3 mm at 45° typical

DICHROIC MIRRORS WITH HIGH TRANSMISSION

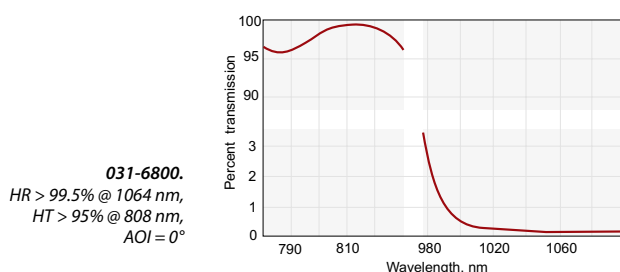


COATING

Technology	Ion Beam Sputtering (IBS)
Laser Damage Threshold	>10 J/cm ² , 8 nsec pulse, 1064 nm typical
Back side antireflection coated	R < 0.1% at AOI = 0° R < 0.25% at AOI = 45°

Reflected wavelength, nm, R > 99.5%	Transmitted wavelength, nm	Transmission, %	AOI	Substrate material	Ø12.7x3 mm		Ø25.4x6 mm	
					Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	808	>99	0	UV FS	041-6800HT	175	042-6800HT	220
1064	808	>99	45	UV FS	041-6805HT	190	042-6805HT	235
1028 – 1080	965 – 982	>98	0	UV FS	041-6200HT	220	042-6200HT	260
1028 – 1080	965 – 982	>98	45	UV FS	041-6205HT	250	042-6205HT	290
1028 – 1080	965 – 982	>98	22.5	UV FS	041-6202HT	220	042-6202HT	260

STANDARD DICHROIC MIRRORS



COATING

Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Laser Damage Threshold:	
BK7	2 J/cm ² , 8 ns pulse, 1064 nm typical
UV FS	5 J/cm ² , 8 ns pulse, 1064 nm typical
Coated Surface Flatness	$\lambda/10$ at 633 nm over 85% of diameter available

Reflected wavelength, nm, R > 99.5%	Transmitted wavelength, nm	Transmission, %	AOI	Substrate material	Ø12.7x3 mm		Ø25.4x6 mm	
					Catalogue number	Price, EUR	Catalogue number	Price, EUR
633	1064	>90	45	BK7	041-6105	90	042-6105	115
1064	633	>90	45	BK7	041-6605	95	042-6605	120
1064	808	>95	0	BK7	031-6800	95	032-6800	120
1064	808	>95	45	BK7	031-6805	95	032-6805	120
1064	808	>95	0	UV FS	041-6800	120	042-6800	150
1064	808	>95	45	UV FS	041-6805	120	042-6805	150

METAL COATED MIRRORS

EKSMA OPTICS offers various size round, rectangular, spherical mirrors protected gold, silver or aluminium.

Metallic mirrors are widely used due to a moderate level of reflection over a very broad spectral range. Protected gold coatings have the highest reflectance in IR, silver is most efficient in VIS, while aluminium is economical reflector over entire 300-IR region.

A layer of dielectric material protects the coatings of the mirrors in order to make them durable. Enhanced metallic coatings provide greater reflection across the operating bandwidth.

As metallic coatings modify the state of polarization of an incident beam, they are inappropriate for polarization sensitive applications.

Type	Average reflection, %	Wavelength, nm	Laser Induced Damage Threshold at 1064 nm, 50 Hz, 11 nsec, J/cm ²
Protected aluminium	>86	300-IR	0.25
Protected silver	>96	400-IR	1.8
Protected gold	>98	900-IR	1.0

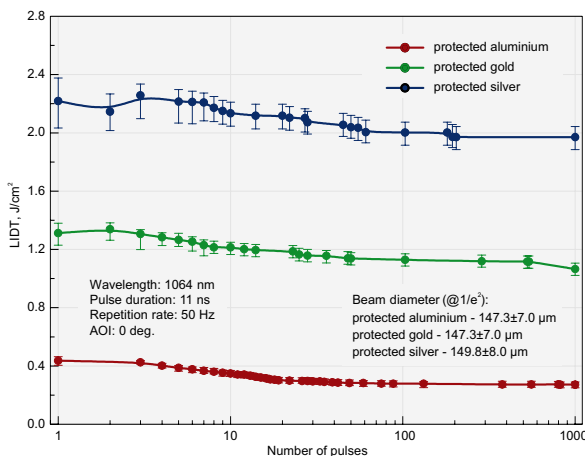
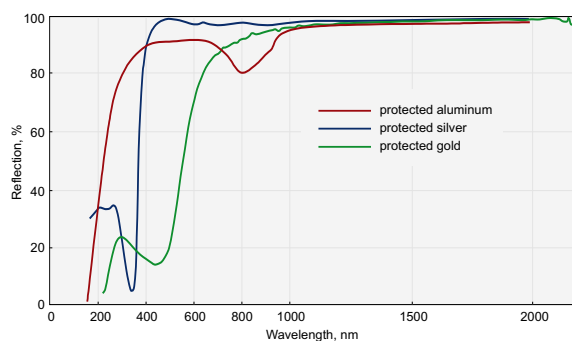
* Laser Induced Damage Threshold results are measured according to ISO 21254-2: 1000-on-1 test procedure.

SPECIFICATIONS for Flat Substrates

Material	BK7, UV FS
S1 Surface Flatness	$\lambda/10$ @ 633 nm
S1 Surface Quality	40 – 20 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Clear Aperture	>90% of the diameter

SPECIFICATIONS for Spherical Substrates

Material	BK7, UV FS
S1 (curved) Surface Flatness	$\lambda/10$ @ 633 nm
S1 (curved) Surface Quality	40 – 20 scratch & dig (MIL-PRF-13830B)
S2 (plane) Surface Quality	Commercial polish
Clear Aperture	>90% of the diameter
Diameter Tolerance	0.00 / -0.13 mm
Thickness Tolerance	± 0.2 mm



Comparison of Protected Ag, Al and Au Mirrors @ 1064 nm, 50 Hz, 11 nsec

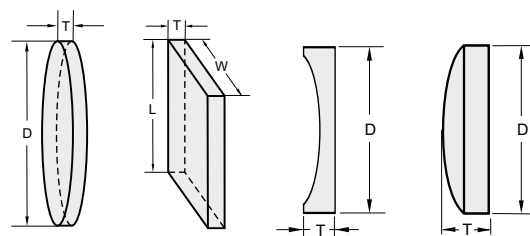
PROTECTED ALUMINIUM MIRRORS

FEATURES

- › LIDT – 0.25 J/cm² at 1064 nm, 50 Hz, 11 nsec pulses*
- › LIDT – 0.1 J/cm² at 355 nm, 50 Hz, 5.7 nsec pulses*
- › Average Reflection >86% for 300 nm – IR
- › BK7, UVFS, Zerodur® substrates available
- › Round, Square and Flat or Spherical Mirrors available
- › OEM capabilities - please contact for special pricing

* Laser Induced Damage Threshold results are measured according to ISO 21254-2: 1000-on-1 test procedure.

Protected Aluminium (Al) Mirrors serve as an economical reflector over entire 300-IR region. Enhanced metallic coatings provide greater reflection across the operating bandwidth.



Drawings of flat round, flat rectangular and spherical mirrors

FLAT RECTANGULAR MIRRORS. Substrate type: plano-plano

Width W, mm	Length L, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
15.0	20.0	6.0	BK7	091-0315	22
20.0	30.0	6.0	BK7	092-0315	29
25.4	25.4	6.0	BK7	093-0315	27
25.4	50.8	10.0	BK7	094-0315	60
50.8	50.8	10.0	BK7	095-0315	90
15.0	20.0	6.0	UV FS	091-3315	36
20.0	30.0	6.0	UV FS	092-3315	47
25.4	25.4	6.0	UV FS	093-3315	45
25.4	50.8	10.0	UV FS	094-3315	95
50.8	50.8	10.0	UV FS	095-3315	135

SPHERICAL MIRRORS. Diameter, D = 12.7 mm. Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	091-0115R-50	35
-75	Plano-concave	BK7	091-0115R-75	35
-100	Plano-concave	BK7	091-0115R-100	35
-150	Plano-concave	BK7	091-0115R-150	35
-200	Plano-concave	BK7	091-0115R-200	35
-250	Plano-concave	BK7	091-0115R-250	35
-300	Plano-concave	BK7	091-0115R-300	35
-400	Plano-concave	BK7	091-0115R-400	35
-500	Plano-concave	BK7	091-0115R-500	35
-1000	Plano-concave	BK7	091-0115R-1000	35
-1500	Plano-concave	BK7	091-0115R-1500	35
-2000	Plano-concave	BK7	091-0115R-2000	35
-50	Plano-concave	UV FS	091-3115R-50	45
-75	Plano-concave	UV FS	091-3115R-75	45
-100	Plano-concave	UV FS	091-3115R-100	45
-150	Plano-concave	UV FS	091-3115R-150	45
-200	Plano-concave	UV FS	091-3115R-200	45
-250	Plano-concave	UV FS	091-3115R-250	45
-300	Plano-concave	UV FS	091-3115R-300	45
-400	Plano-concave	UV FS	091-3115R-400	45

SPHERICAL MIRRORS. Diameter, D = 25.4 mm. Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	092-0115R-50	55
-75	Plano-concave	BK7	092-0115R-75	55
-100	Plano-concave	BK7	092-0115R-100	55
-150	Plano-concave	BK7	092-0115R-150	55
-200	Plano-concave	BK7	092-0115R-200	55
-250	Plano-concave	BK7	092-0115R-250	55
-300	Plano-concave	BK7	092-0115R-300	55
-400	Plano-concave	BK7	092-0115R-400	55
-500	Plano-concave	BK7	092-0115R-500	55
-600	Plano-concave	BK7	092-0115R-600	55
-750	Plano-concave	BK7	092-0115R-750	55
-800	Plano-concave	BK7	092-0115R-800	55
-1000	Plano-concave	BK7	092-0115R-1000	55
-1500	Plano-concave	BK7	092-0115R-1500	55
-2000	Plano-concave	BK7	092-0115R-2000	55
-2500	Plano-concave	BK7	092-0115R-2500	55
-3000	Plano-concave	BK7	092-0115R-3000	55
-4000	Plano-concave	BK7	092-0115R-4000	55
-5000	Plano-concave	BK7	092-0115R-5000	55
-6000	Plano-concave	BK7	092-0115R-6000	55
-8000	Plano-concave	BK7	092-0115R-8000	55

FLAT ROUND MIRRORS. Substrate type: plano-plano

Diameter D, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
12.7	3.0	BK7	091-0015	20
12.7	6.0	BK7	091-0015T6	20
25.4	6.0	BK7	092-0015	25
50.8	8.0	BK7	095-0015	80
76.2	12.7	BK7	097-0015	160
101.6	15.0	BK7	098-0015	260
12.7	3.0	UV FS	091-3015	30
12.7	6.0	UV FS	091-3015T6	30
25.4	6.0	UV FS	092-3015	35
50.8	8.0	UV FS	095-3015	120
76.2	12.7	UV FS	097-3015	195
101.6	15.0	UV FS	098-3015	340

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-500	Plano-concave	UV FS	091-3115R-500	45
-1000	Plano-concave	UV FS	091-3115R-1000	45
-1500	Plano-concave	UV FS	091-3115R-1500	45
-2000	Plano-concave	UV FS	091-3115R-2000	45
+50	Plano-convex	BK7	091-0215R+50	37
+75	Plano-convex	BK7	091-0215R+75	37
+100	Plano-convex	BK7	091-0215R+100	37
+150	Plano-convex	BK7	091-0215R+150	37
+200	Plano-convex	BK7	091-0215R+200	37
+300	Plano-convex	BK7	091-0215R+300	37
+400	Plano-convex	BK7	091-0215R+400	37
+500	Plano-convex	BK7	091-0215R+500	37
+50	Plano-convex	UV FS	091-3215R+50	48
+75	Plano-convex	UV FS	091-3215R+75	48
+100	Plano-convex	UV FS	091-3215R+100	48
+150	Plano-convex	UV FS	091-3215R+150	48
+200	Plano-convex	UV FS	091-3215R+200	48
+300	Plano-convex	UV FS	091-3215R+300	48
+400	Plano-convex	UV FS	091-3215R+400	48
+500	Plano-convex	UV FS	091-3215R+500	48

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	UV FS	092-3115R-50	70
-75	Plano-concave	UV FS	092-3115R-75	70
-100	Plano-concave	UV FS	092-3115R-100	70
-150	Plano-concave	UV FS	092-3115R-150	70
-200	Plano-concave	UV FS	092-3115R-200	70
-250	Plano-concave	UV FS	092-3115R-250	70
-300	Plano-concave	UV FS	092-0115R-300	70
-400	Plano-concave	UV FS	092-0115R-400	70
-500	Plano-concave	UV FS	092-3115R-500	70
-600	Plano-concave	UV FS	092-3115R-600	70
-750	Plano-concave	UV FS	092-3115R-750	70
-800	Plano-concave	UV FS	092-3115R-800	70
-1000	Plano-concave	UV FS	092-3115R-1000	70
-1500	Plano-concave	UV FS	092-3115R-1500	55
-2000	Plano-concave	UV FS	092-3115R-2000	70
-2500	Plano-concave	UV FS	092-3115R-2500	70
-3000	Plano-concave	UV FS	092-0115R-3000	70
-4000	Plano-concave	UV FS	092-3115R-4000	70
-5000	Plano-concave	UV FS	092-3115R-5000	70
-6000	Plano-concave	UV FS	092-0115R-6000	70
-8000	Plano-concave	UV FS	092-0115R-8000	70

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+50	Plano-convex	BK7	092-0215R+50	59
+75	Plano-convex	BK7	092-0215R+75	59
+100	Plano-convex	BK7	092-0215R+100	59
+150	Plano-convex	BK7	092-0215R+150	59
+200	Plano-convex	BK7	092-0215R+200	59
+300	Plano-convex	BK7	092-0215R+300	59
+400	Plano-convex	BK7	092-0215R+400	59
+500	Plano-convex	BK7	092-0215R+500	59
+600	Plano-convex	BK7	092-0215R+600	59
+800	Plano-convex	BK7	092-0215R+800	59
+1000	Plano-convex	BK7	092-0215R+1000	59
+1500	Plano-convex	BK7	092-0215R+1500	59
+2000	Plano-convex	BK7	092-0215R+2000	59
+4000	Plano-convex	BK7	092-0215R+4000	59
+5000	Plano-convex	BK7	092-0215R+5000	59

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+50	Plano-convex	UV FS	092-3215R+50	75
+75	Plano-convex	UV FS	092-3215R+75	75
+100	Plano-convex	UV FS	092-3215R+100	75
+150	Plano-convex	UV FS	092-3215R+150	75
+200	Plano-convex	UV FS	092-3215R+200	75
+300	Plano-convex	UV FS	092-3215R+300	75
+400	Plano-convex	UV FS	092-3215R+400	75
+500	Plano-convex	UV FS	092-3215R+500	75
+600	Plano-convex	UV FS	092-3215R+600	75
+800	Plano-convex	UV FS	092-3215R+800	75
+1000	Plano-convex	UV FS	092-3215R+1000	75
+1500	Plano-convex	UV FS	092-3215R+1500	75
+2000	Plano-convex	UV FS	092-3215R+2000	75
+4000	Plano-convex	UV FS	092-3215R+4000	75
+5000	Plano-convex	UV FS	092-3215R+5000	75

COATINGS

WINDOWS & FILTERS

SPHERICAL MIRRORS. Diameter, D = 50.8 mm. Thickness (edge for plano-concave, center for plano-convex), T = 10.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-100	Plano-concave	BK7	095-0115R-100	118
-150	Plano-concave	BK7	095-0115R-150	118
-200	Plano-concave	BK7	095-0115R-200	118
-250	Plano-concave	BK7	095-0115R-250	118
-300	Plano-concave	BK7	095-0115R-300	118
-400	Plano-concave	BK7	095-0115R-400	118
-500	Plano-concave	BK7	095-0115R-500	118
-600	Plano-concave	BK7	095-0115R-600	118
-800	Plano-concave	BK7	095-0115R-800	118
-1000	Plano-concave	BK7	095-0115R-1000	118
-1500	Plano-concave	BK7	095-0115R-1500	118
-2000	Plano-concave	BK7	095-0115R-2000	118
-2500	Plano-concave	BK7	095-0115R-2500	118
-3000	Plano-concave	BK7	095-0115R-3000	118
-4000	Plano-concave	BK7	095-0115R-4000	118
-5000	Plano-concave	BK7	095-0115R-5000	118
-6000	Plano-concave	BK7	095-0115R-6000	118
-8000	Plano-concave	BK7	095-0115R-8000	118
-10000	Plano-concave	BK7	095-0115R-10000	118
-100	Plano-concave	UV FS	095-3115R-100	143
-150	Plano-concave	UV FS	095-3115R-150	143
-200	Plano-concave	UV FS	095-3115R-200	143
-250	Plano-concave	UV FS	095-3115R-250	143
-300	Plano-concave	UV FS	095-3115R-300	143
-400	Plano-concave	UV FS	095-3115R-400	143
-500	Plano-concave	UV FS	095-3115R-500	143
-600	Plano-concave	UV FS	095-3115R-600	143
-800	Plano-concave	UV FS	095-3115R-800	143
-1000	Plano-concave	UV FS	095-3115R-1000	143
-1500	Plano-concave	UV FS	095-3115R-1500	143
-2000	Plano-concave	UV FS	095-3115R-2000	143
-2500	Plano-concave	UV FS	095-3115R-2500	143
-3000	Plano-concave	UV FS	095-3115R-3000	143
-4000	Plano-concave	UV FS	095-3115R-4000	143
-5000	Plano-concave	UV FS	095-3115R-5000	143
-6000	Plano-concave	UV FS	095-3115R-6000	143
-8000	Plano-concave	UV FS	095-3115R-8000	143
-10000	Plano-concave	UV FS	095-3115R-10000	143

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+100	Plano-convex	BK7	095-0215R+100	127
+150	Plano-convex	BK7	095-0215R+150	127
+200	Plano-convex	BK7	095-0215R+200	127
+300	Plano-convex	BK7	095-0215R+300	127
+400	Plano-convex	BK7	095-0215R+400	127
+500	Plano-convex	BK7	095-0215R+500	127
+600	Plano-convex	BK7	095-0215R+600	127
+800	Plano-convex	BK7	095-0215R+800	127
+1000	Plano-convex	BK7	095-0215R+1000	127
+1500	Plano-convex	BK7	095-0215R+1500	127
+2000	Plano-convex	BK7	095-0215R+2000	127
+100	Plano-convex	UV FS	095-3215R+100	153
+150	Plano-convex	UV FS	095-3215R+150	153
+200	Plano-convex	UV FS	095-3215R+200	153
+300	Plano-convex	UV FS	095-3215R+300	153
+400	Plano-convex	UV FS	095-3215R+400	153
+500	Plano-convex	UV FS	095-3215R+500	153
+600	Plano-convex	UV FS	095-3215R+600	153
+800	Plano-convex	UV FS	095-3215R+800	153
+1000	Plano-convex	UV FS	095-3215R+1000	153
+1500	Plano-convex	UV FS	095-3215R+1500	153
+2000	Plano-convex	UV FS	095-3215R+2000	153

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

RELATED PRODUCTS

Curved Windows. *See page 1.8*

Kinematic Mirror Mount
840-0010

Find more at
[EksmaOptics.com](#)



Adapter for Mirror at 45°
840-0115

Find more at
[EksmaOptics.com](#)



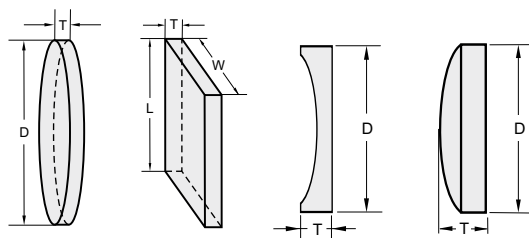
PROTECTED SILVER MIRRORS

FEATURES

- ↳ LIDT – 0.25 J/cm² at 800 nm, 50 Hz, 94 fsec pulses*
- ↳ LIDT – 1.8 J/cm² at 1064 nm, 50 Hz, 11 nsec pulses*
- ↳ Average Reflection >97% for 400 nm – IR
- ↳ BK7, UVFS, Zerodur® substrates available
- ↳ Round, Square and Flat or Spherical Mirrors available
- ↳ OEM capabilities – please contact for special pricing
- ↳ Test samples are available on request

* Laser Induced Damage Threshold results are measured according to ISO 21254-2: 1000-on-1 test procedure.

Protected Silver (Ag) Mirrors feature higher reflectance than aluminium throughout the visible and near-infrared spectral region. Our protected silver mirrors has excellent durability.



Drawings of flat round, flat rectangular and spherical mirrors

FLAT RECTANGULAR MIRRORS. Substrate type: plano-plano

Width W, mm	Length L, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
15.0	20.0	6.0	BK7	091-0325	36
20.0	30.0	6.0	BK7	092-0325	48
25.4	25.4	6.0	BK7	093-0325	46
25.4	50.8	10.0	BK7	094-0325	70
50.8	50.8	10.0	BK7	095-0325	100
15.0	20.0	6.0	UV FS	091-3325	50
20.0	30.0	6.0	UV FS	092-3325	66
25.4	25.4	6.0	UV FS	093-3325	64
25.4	50.8	10.0	UV FS	094-3325	105
50.8	50.8	10.0	UV FS	095-3325	145

FLAT ROUND MIRRORS. Substrate type: plano-plano

Diameter D, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
12.7	3.0	BK7	091-0025	26
12.7	6.0	BK7	091-0025T6	26
25.4	6.0	BK7	092-0025	39
50.8	8.0	BK7	095-0025	90
76.2	12.7	BK7	097-0025	180
101.6	15.0	BK7	098-0025	330
12.7	3.0	UV FS	091-3025	36
12.7	6.0	UV FS	091-3025T6	36
25.4	6.0	UV FS	092-3025	44
50.8	8.0	UV FS	095-3025	96
76.2	12.7	UV FS	097-3025	215
101.6	15.0	UV FS	098-3025	410

SPHERICAL MIRRORS. Diameter, D = 12.7 mm. Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	091-0125R-50	42
-75	Plano-concave	BK7	091-0125R-75	42
-100	Plano-concave	BK7	091-0125R-100	42
-150	Plano-concave	BK7	091-0125R-150	42
-200	Plano-concave	BK7	091-0125R-200	42
-250	Plano-concave	BK7	091-0125R-250	42
-300	Plano-concave	BK7	091-0125R-300	42
-400	Plano-concave	BK7	091-0125R-400	42
-500	Plano-concave	BK7	091-0125R-500	42
-1000	Plano-concave	BK7	091-0125R-1000	42
-1500	Plano-concave	BK7	091-0125R-1500	42
-2000	Plano-concave	BK7	091-0125R-2000	42
-50	Plano-concave	UV FS	091-3125R-50	52
-75	Plano-concave	UV FS	091-3125R-75	52
-100	Plano-concave	UV FS	091-3125R-100	52
-150	Plano-concave	UV FS	091-3125R-150	52
-200	Plano-concave	UV FS	091-3125R-200	52
-250	Plano-concave	UV FS	091-3125R-250	52
-300	Plano-concave	UV FS	091-3125R-300	52
-400	Plano-concave	UV FS	091-3125R-400	52
-500	Plano-concave	UV FS	091-3125R-500	52
-1000	Plano-concave	UV FS	091-3125R-1000	52
-1500	Plano-concave	UV FS	091-3125R-1500	52
-2000	Plano-concave	UV FS	091-3125R-2000	52

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+50	Plano-convex	BK7	091-0225R+50	44
+100	Plano-convex	BK7	091-0225R+100	44
+150	Plano-convex	BK7	091-0225R+150	44
+200	Plano-convex	BK7	091-0225R+200	44
+300	Plano-convex	BK7	091-0225R+300	44
+400	Plano-convex	BK7	091-0225R+400	44
+500	Plano-convex	BK7	091-0225R+500	44
+50	Plano-convex	UV FS	091-3225R+50	55
+100	Plano-convex	UV FS	091-3225R+100	55
+150	Plano-convex	UV FS	091-3225R+150	55
+200	Plano-convex	UV FS	091-3225R+200	55
+300	Plano-convex	UV FS	091-3225R+300	55
+400	Plano-convex	UV FS	091-3225R+400	55
+500	Plano-convex	UV FS	091-3225R+500	55

SPHERICAL MIRRORS. Diameter, D = 25.4 mm. Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	092-0125R-50	65
-75	Plano-concave	BK7	092-0125R-75	65
-100	Plano-concave	BK7	092-0125R-100	65
-150	Plano-concave	BK7	092-0125R-150	65
-200	Plano-concave	BK7	092-0125R-200	65
-250	Plano-concave	BK7	092-0125R-250	65
-300	Plano-concave	BK7	092-0125R-300	65
-400	Plano-concave	BK7	092-0125R-400	65
-500	Plano-concave	BK7	092-0125R-500	65
-600	Plano-concave	BK7	092-0125R-600	65
-750	Plano-concave	BK7	092-0125R-750	65
-800	Plano-concave	BK7	092-0125R-800	65
-1000	Plano-concave	BK7	092-0125R-1000	65
-1500	Plano-concave	BK7	092-0125R-1500	65
-2000	Plano-concave	BK7	092-0125R-2000	65
-2500	Plano-concave	BK7	092-0125R-2500	65
-3000	Plano-concave	BK7	092-0125R-3000	65
-4000	Plano-concave	BK7	092-0125R-4000	65
-5000	Plano-concave	BK7	092-0125R-5000	65
-6000	Plano-concave	BK7	092-0125R-6000	65
-8000	Plano-concave	BK7	092-0125R-8000	65
-50	Plano-concave	UV FS	092-3125R-50	80
-75	Plano-concave	UV FS	092-3125R-75	80
-100	Plano-concave	UV FS	092-3125R-100	80
-150	Plano-concave	UV FS	092-3125R-150	80
-200	Plano-concave	UV FS	092-3125R-200	80
-250	Plano-concave	UV FS	092-3125R-250	80
-300	Plano-concave	UV FS	092-0125R-300	80
-400	Plano-concave	UV FS	092-0125R-400	80
-500	Plano-concave	UV FS	092-3125R-500	80
-600	Plano-concave	UV FS	092-3125R-600	80
-750	Plano-concave	UV FS	092-3125R-750	80
-800	Plano-concave	UV FS	092-3125R-800	80
-1000	Plano-concave	UV FS	092-3125R-1000	80
-1500	Plano-concave	UV FS	092-3125R-1500	80

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-2000	Plano-concave	UV FS	092-3125R-2000	80
-2500	Plano-concave	UV FS	092-3125R-2500	80
-3000	Plano-concave	UV FS	092-0125R-3000	80
-4000	Plano-concave	UV FS	092-3125R-4000	80
-5000	Plano-concave	UV FS	092-3125R-5000	80
-6000	Plano-concave	UV FS	092-0125R-6000	80
-8000	Plano-concave	UV FS	092-0125R-8000	80
+50	Plano-convex	BK7	092-0225R+50	69
+100	Plano-convex	BK7	092-0225R+100	69
+150	Plano-convex	BK7	092-0225R+150	69
+200	Plano-convex	BK7	092-0225R+200	69
+300	Plano-convex	BK7	092-0225R+300	69
+400	Plano-convex	BK7	092-0225R+400	69
+500	Plano-convex	BK7	092-0225R+500	69
+600	Plano-convex	BK7	092-0225R+600	69
+800	Plano-convex	BK7	092-0225R+800	69
+1000	Plano-convex	BK7	092-0225R+1000	69
+1500	Plano-convex	BK7	092-0225R+1500	69
+2000	Plano-convex	BK7	092-0225R+2000	69
+4000	Plano-convex	BK7	092-0225R+4000	69
+5000	Plano-convex	BK7	092-0225R+5000	69
+50	Plano-convex	UV FS	092-3225R+50	85
+100	Plano-convex	UV FS	092-3225R+100	85
+150	Plano-convex	UV FS	092-3225R+150	85
+200	Plano-convex	UV FS	092-3225R+200	85
+300	Plano-convex	UV FS	092-3225R+300	85
+400	Plano-convex	UV FS	092-3225R+400	85
+500	Plano-convex	UV FS	092-3225R+500	85
+600	Plano-convex	UV FS	092-3225R+600	85
+800	Plano-convex	UV FS	092-3225R+800	85
+1000	Plano-convex	UV FS	092-3225R+1000	85
+1500	Plano-convex	UV FS	092-3225R+1500	85
+2000	Plano-convex	UV FS	092-3225R+2000	85
+4000	Plano-convex	UV FS	092-3225R+4000	85
+5000	Plano-convex	UV FS	092-3225R+5000	85

COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

SPHERICAL MIRRORS. Diameter, D = 50.8 mm. Thickness (edge for plano-concave, center for plano-convex), T = 10.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-100	Plano-concave	BK7	095-0125R-100	164
-150	Plano-concave	BK7	095-0125R-150	164
-200	Plano-concave	BK7	095-0125R-200	164
-250	Plano-concave	BK7	095-0125R-250	164
-300	Plano-concave	BK7	095-0125R-300	164
-400	Plano-concave	BK7	095-0125R-400	164
-500	Plano-concave	BK7	095-0125R-500	164
-600	Plano-concave	BK7	095-0125R-600	164
-800	Plano-concave	BK7	095-0125R-800	164
-1000	Plano-concave	BK7	095-0125R-1000	164
-1500	Plano-concave	BK7	095-0125R-1500	164
-2000	Plano-concave	BK7	095-0125R-2000	164
-2500	Plano-concave	BK7	095-0125R-2500	164
-3000	Plano-concave	BK7	095-0125R-3000	164
-4000	Plano-concave	BK7	095-0125R-4000	164
-5000	Plano-concave	BK7	095-0125R-5000	164
-6000	Plano-concave	BK7	095-0125R-6000	164
-8000	Plano-concave	BK7	095-0125R-8000	164
-10000	Plano-concave	BK7	095-0125R-10000	164

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-100	Plano-concave	UV FS	095-3125R-100	189
-150	Plano-concave	UV FS	095-3125R-150	189
-200	Plano-concave	UV FS	095-3125R-200	189
-250	Plano-concave	UV FS	095-0125R-250	189
-300	Plano-concave	UV FS	095-3125R-300	189
-400	Plano-concave	UV FS	095-3125R-400	189
-500	Plano-concave	UV FS	095-3125R-500	189
-600	Plano-concave	UV FS	095-3125R-600	189
-800	Plano-concave	UV FS	095-3125R-800	189
-1000	Plano-concave	UV FS	095-3125R-1000	189
-1500	Plano-concave	UV FS	095-3125R-1500	189
-2000	Plano-concave	UV FS	095-3125R-2000	189
-2500	Plano-concave	UV FS	095-3125R-2500	189
-3000	Plano-concave	UV FS	095-3125R-3000	189
-4000	Plano-concave	UV FS	095-3125R-4000	189
-5000	Plano-concave	UV FS	095-3125R-5000	189
-6000	Plano-concave	UV FS	095-0125R-6000	189
-8000	Plano-concave	UV FS	095-0125R-8000	189
-10000	Plano-concave	UV FS	095-3125R-10000	189

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+100	Plano-convex	BK7	095-0225R+100	174
+150	Plano-convex	BK7	095-0225R+150	174
+200	Plano-convex	BK7	095-0225R+200	174
+300	Plano-convex	BK7	095-0225R+300	174
+400	Plano-convex	BK7	095-0225R+400	174
+500	Plano-convex	BK7	095-0225R+500	174
+600	Plano-convex	BK7	095-0225R+600	174
+800	Plano-convex	BK7	095-0225R+800	174
+1000	Plano-convex	BK7	095-0225R+1000	174
+1500	Plano-convex	BK7	095-0225R+1500	174
+2000	Plano-convex	BK7	095-0225R+2000	174

SPHERICAL MIRRORS. Diameter, D = 76.2 mm. Thickness (edge for plano-concave, center for plano-convex), T = 12.7 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-200	Plano-concave	BK7	097-0125R-200	250
-300	Plano-concave	BK7	097-0125R-300	250
-400	Plano-concave	BK7	097-0125R-400	250
-500	Plano-concave	BK7	097-0125R-500	250
-600	Plano-concave	BK7	097-0125R-600	250
-800	Plano-concave	BK7	097-0125R-800	250
-1000	Plano-concave	BK7	097-0125R-1000	250
-2000	Plano-concave	BK7	097-0125R-2000	250
-3000	Plano-concave	BK7	097-0125R-3000	250
-200	Plano-concave	UV FS	097-3125R-200	340
-300	Plano-concave	UV FS	097-3125R-300	340
-400	Plano-concave	UV FS	097-3125R-400	340
-500	Plano-concave	UV FS	097-3125R-500	340
-600	Plano-concave	UV FS	097-3125R-600	340
-800	Plano-concave	UV FS	097-3125R-800	340
-1000	Plano-concave	UV FS	097-3125R-1000	340
-2000	Plano-concave	UV FS	097-3125R-2000	340
-3000	Plano-concave	UV FS	097-3125R-3000	340

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+100	Plano-convex	UV FS	095-3225R+100	199
+150	Plano-convex	UV FS	095-3225R+150	199
+200	Plano-convex	UV FS	095-3225R+200	199
+300	Plano-convex	UV FS	095-3225R+300	199
+400	Plano-convex	UV FS	095-3225R-400	199
+500	Plano-convex	UV FS	095-3225R+500	199
+600	Plano-convex	UV FS	095-3225R+600	199
+800	Plano-convex	UV FS	095-3225R+800	199
+1000	Plano-convex	UV FS	095-3225R+1000	199
+1500	Plano-convex	UV FS	095-3225R+1500	199
+2000	Plano-convex	UV FS	095-3225R+2000	199

SPHERICAL MIRRORS. Diameter, D = 101.6 mm. Thickness (edge for plano-concave, center for plano-convex), T = 15.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-300	Plano-concave	BK7	098-0125R-300	590
-400	Plano-concave	BK7	098-0125R-400	590
-500	Plano-concave	BK7	098-0125R-500	590
-600	Plano-concave	BK7	098-0125R-600	590
-800	Plano-concave	BK7	098-0125R-800	590
-1000	Plano-concave	BK7	098-0125R-1000	590
-2000	Plano-concave	BK7	098-0125R-2000	590
-3000	Plano-concave	BK7	098-0125R-3000	590
-300	Plano-concave	UV FS	098-3125R-300	690
-400	Plano-concave	UV FS	098-3125R-400	690
-500	Plano-concave	UV FS	098-3125R-500	690
-600	Plano-concave	UV FS	098-3125R-600	690
-800	Plano-concave	UV FS	098-3125R-800	690
-1000	Plano-concave	UV FS	098-3125R-1000	690
-2000	Plano-concave	UV FS	098-3125R-2000	690
-3000	Plano-concave	UV FS	098-3125R-3000	690

RELATED PRODUCTS

Curved Windows. See page 1.8

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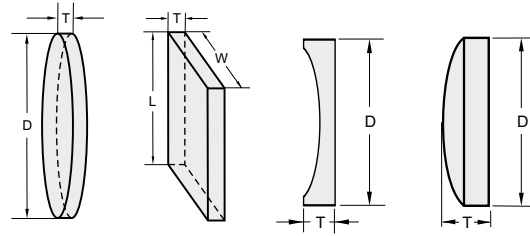
PROTECTED GOLD MIRRORS

FEATURES

- LIDT – 1.0 J/cm² at 1064 nm, 50 Hz, 11 nsec pulses*
- Average Reflection >98% for 900 nm – IR
- BK7, UVFS, Zerodur® substrates available
- Round, Square and Flat or Spherical Mirrors available
- OEM capabilities - please contact for special pricing
- Test samples are available on request
- Bare Gold coated mirrors are available as an option

* Laser Induced Damage Threshold results are measured according to ISO 21254-2: 1000-on-1 test procedure.

Protected Gold (Au) Mirrors have the highest reflectance in infrared. Enhanced metallic coatings provide greater reflection across the operating bandwidth.



Drawings of flat round, flat rectangular and spherical mirrors

FLAT RECTANGULAR MIRRORS. Substrate type: plano-plano

Width W, mm	Length L, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
15.0	20.0	6.0	BK7	091-0330	55
20.0	30.0	6.0	BK7	092-0330	69
25.4	25.4	6.0	BK7	093-0330	52
25.4	50.8	10.0	BK7	094-0330	95
50.8	50.8	10.0	BK7	095-0330	105
15.0	20.0	6.0	UV FS	091-3330	69
20.0	30.0	6.0	UV FS	092-3330	87
25.4	25.4	6.0	UV FS	093-3330	83
25.4	50.8	10.0	UV FS	094-3330	130
50.8	50.8	10.0	UV FS	095-3330	175

FLAT ROUND MIRRORS. Substrate type: plano-plano

Diameter D, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
12.7	3.0	BK7	091-0030	35
12.7	6.0	BK7	091-0030T6	35
25.4	6.0	BK7	092-0030	43
50.8	8.0	BK7	095-0030	115
76.2	12.7	BK7	097-0030	210
101.6	15.0	BK7	098-0030	430
12.7	3.0	UV FS	091-3030	45
12.7	6.0	UV FS	091-3030T6	45
25.4	6.0	UV FS	092-3030	47
50.8	8.0	UV FS	095-3030	97
76.2	12.7	UV FS	097-3030	245
101.6	15.0	UV FS	098-3030	510

SPHERICAL MIRRORS. Diameter, D = 12.7 mm. Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	091-0130R-50	52
-75	Plano-concave	BK7	091-0130R-75	52
-100	Plano-concave	BK7	091-0130R-100	52
-150	Plano-concave	BK7	091-0130R-150	52
-200	Plano-concave	BK7	091-0130R-200	52
-250	Plano-concave	BK7	091-0130R-250	52
-300	Plano-concave	BK7	091-0130R-300	52
-400	Plano-concave	BK7	091-0130R-400	52
-500	Plano-concave	BK7	091-0130R-500	52
-1000	Plano-concave	BK7	091-0130R-1000	52
-1500	Plano-concave	BK7	091-0130R-1500	52
-2000	Plano-concave	BK7	091-0130R-2000	52
-50	Plano-concave	UV FS	091-3130R-50	52
-75	Plano-concave	UV FS	091-3130R-75	62
-100	Plano-concave	UV FS	091-3130R-100	62
-150	Plano-concave	UV FS	091-3130R-150	62
-200	Plano-concave	UV FS	091-3130R-200	62
-250	Plano-concave	UV FS	091-3130R-250	62
-300	Plano-concave	UV FS	091-3130R-300	62
-400	Plano-concave	UV FS	091-3130R-400	62
-500	Plano-concave	UV FS	091-3130R-500	62
-1000	Plano-concave	UV FS	091-3130R-1000	62
-1500	Plano-concave	UV FS	091-3130R-1500	62
-2000	Plano-concave	UV FS	091-3130R-2000	62

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+50	Plano-convex	BK7	091-0230R+50	54
+100	Plano-convex	BK7	091-0230R+100	54
+150	Plano-convex	BK7	091-0230R+150	54
+200	Plano-convex	BK7	091-0230R+200	54
+300	Plano-convex	BK7	091-0230R+300	54
+400	Plano-convex	BK7	091-0230R+400	54
+500	Plano-convex	BK7	091-0230R+500	54
+50	Plano-convex	UV FS	091-3230R+50	65
+100	Plano-convex	UV FS	091-3230R+100	65
+150	Plano-convex	UV FS	091-3230R+150	65
+200	Plano-convex	UV FS	091-3230R+200	65
+300	Plano-convex	UV FS	091-3230R+300	65
+400	Plano-convex	UV FS	091-3230R+400	65
+500	Plano-convex	UV FS	091-3230R+500	65

SPHERICAL MIRRORS. Diameter, D = 25.4 mm. Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	092-0130R-50	95
-75	Plano-concave	BK7	092-0130R-75	95
-100	Plano-concave	BK7	092-0130R-100	95
-150	Plano-concave	BK7	092-0130R-150	95
-200	Plano-concave	BK7	092-0130R-200	95
-250	Plano-concave	BK7	092-0130R-250	95
-300	Plano-concave	BK7	092-0130R-300	95
-400	Plano-concave	BK7	092-0130R-400	95
-500	Plano-concave	BK7	092-0130R-500	95
-600	Plano-concave	BK7	092-0130R-600	95
-750	Plano-concave	BK7	092-0130R-750	95
-800	Plano-concave	BK7	092-0130R-800	95
-1000	Plano-concave	BK7	092-0130R-1000	95
-1500	Plano-concave	BK7	092-0130R-1500	95
-2000	Plano-concave	BK7	092-0130R-2000	95
-2500	Plano-concave	BK7	092-0130R-2500	95
-3000	Plano-concave	BK7	092-0130R-3000	95
-4000	Plano-concave	BK7	092-0130R-4000	95
-5000	Plano-concave	BK7	092-0130R-5000	95
-6000	Plano-concave	BK7	092-0130R-6000	95
-8000	Plano-concave	BK7	092-0130R-8000	95
-50	Plano-concave	UV FS	092-3130R-50	110
-75	Plano-concave	UV FS	092-3130R-75	110
-100	Plano-concave	UV FS	092-3130R-100	110
-150	Plano-concave	UV FS	092-3130R-150	110
-200	Plano-concave	UV FS	092-3130R-200	110
-250	Plano-concave	UV FS	092-3130R-250	110
-300	Plano-concave	UV FS	092-3130R-300	110
-400	Plano-concave	UV FS	092-3130R-400	110
-500	Plano-concave	UV FS	092-3130R-500	110
-600	Plano-concave	UV FS	092-3130R-600	110
-750	Plano-concave	UV FS	092-3130R-750	110
-800	Plano-concave	UV FS	092-3130R-800	110
-1000	Plano-concave	UV FS	092-3130R-1000	110
-1500	Plano-concave	UV FS	092-3130R-1500	110

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-2000	Plano-concave	UV FS	092-3130R-2000	110
-2500	Plano-concave	UV FS	092-3130R-2500	110
-3000	Plano-concave	UV FS	092-3130R-3000	110
-4000	Plano-concave	UV FS	092-3130R-4000	110
-5000	Plano-concave	UV FS	092-3130R-5000	110
-6000	Plano-concave	UV FS	092-3130R-6000	110
-8000	Plano-concave	UV FS	092-3130R-8000	110
+50	Plano-convex	BK7	092-0230R+50	99
+100	Plano-convex	BK7	092-0230R+100	99
+150	Plano-convex	BK7	092-0230R+150	99
+200	Plano-convex	BK7	092-0230R+200	99
+300	Plano-convex	BK7	092-0230R+300	99
+400	Plano-convex	BK7	092-0230R+400	99
+500	Plano-convex	BK7	092-0230R+500	99
+600	Plano-convex	BK7	092-0230R+600	99
+800	Plano-convex	BK7	092-0230R+800	99
+1000	Plano-convex	BK7	092-0230R+1000	99
+1500	Plano-convex	BK7	092-0230R+1500	99
+2000	Plano-convex	BK7	092-0230R+2000	99
+4000	Plano-convex	BK7	092-0230R+4000	99
+5000	Plano-convex	BK7	092-0230R+5000	99
+50	Plano-convex	UV FS	092-3230R+50	115
+100	Plano-convex	UV FS	092-3230R+100	115
+150	Plano-convex	UV FS	092-3230R+150	115
+200	Plano-convex	UV FS	092-3230R+200	115
+300	Plano-convex	UV FS	092-3230R+300	115
+400	Plano-convex	UV FS	092-3230R+400	115
+500	Plano-convex	UV FS	092-3230R+500	115
+600	Plano-convex	UV FS	092-3230R+600	115
+800	Plano-convex	UV FS	092-3230R+800	115
+1000	Plano-convex	UV FS	092-3230R+1000	115
+1500	Plano-convex	UV FS	092-3230R+1500	115
+2000	Plano-convex	UV FS	092-3230R+2000	115
+4000	Plano-convex	UV FS	092-3230R+4000	115
+5000	Plano-convex	UV FS	092-3230R+5000	115

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SPHERICAL MIRRORS. Diameter, D = 50.8 mm. Thickness (edge for plano-concave, center for plano-convex), T = 10.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-100	Plano-concave	BK7	095-0130R-100	174
-150	Plano-concave	BK7	095-0130R-150	174
-200	Plano-concave	BK7	095-0130R-200	174
-250	Plano-concave	BK7	095-0130R-250	174
-300	Plano-concave	BK7	095-0130R-300	174
-400	Plano-concave	BK7	095-0130R-400	174
-500	Plano-concave	BK7	095-0130R-500	174
-600	Plano-concave	BK7	095-0130R-600	174
-800	Plano-concave	BK7	095-0130R-800	174
-1000	Plano-concave	BK7	095-0130R-1000	174
-1500	Plano-concave	BK7	095-0130R-1500	174
-2000	Plano-concave	BK7	095-0130R-2000	174
-2500	Plano-concave	BK7	095-0130R-2500	174
-3000	Plano-concave	BK7	095-0130R-3000	174
-4000	Plano-concave	BK7	095-0130R-4000	174
-5000	Plano-concave	BK7	095-0130R-5000	174
-6000	Plano-concave	BK7	095-0130R-6000	174
-8000	Plano-concave	BK7	095-0130R-8000	174
-10000	Plano-concave	BK7	095-0130R-10000	174
-100	Plano-concave	UV FS	095-3130R-100	199
-150	Plano-concave	UV FS	095-3130R-150	199
-200	Plano-concave	UV FS	095-3130R-200	199
-250	Plano-concave	UV FS	095-3130R-250	199
-300	Plano-concave	UV FS	095-3130R-300	199
-400	Plano-concave	UV FS	095-3130R-400	199
-500	Plano-concave	UV FS	095-3130R-500	199
-600	Plano-concave	UV FS	095-3130R-600	199
-800	Plano-concave	UV FS	095-3130R-800	199
-1000	Plano-concave	UV FS	095-3130R-1000	199
-1500	Plano-concave	UV FS	095-3130R-1500	199
-2000	Plano-concave	UV FS	095-3130R-2000	199
-2500	Plano-concave	UV FS	095-3130R-2500	199
-3000	Plano-concave	UV FS	095-3130R-3000	199
-4000	Plano-concave	UV FS	095-3130R-4000	199
-5000	Plano-concave	UV FS	095-3130R-5000	199
-6000	Plano-concave	UV FS	095-3130R-6000	199
-8000	Plano-concave	UV FS	095-3130R-8000	199
-10000	Plano-concave	UV FS	095-3130R-10000	199

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+100	Plano-convex	BK7	095-0230R+100	173
+150	Plano-convex	BK7	095-0230R+150	173
+200	Plano-convex	BK7	095-0230R+200	173
+300	Plano-convex	BK7	095-0230R+300	173
+400	Plano-convex	BK7	095-0230R+400	173
+500	Plano-convex	BK7	095-0230R+500	173
+600	Plano-convex	BK7	095-0230R+600	173
+800	Plano-convex	BK7	095-0230R+800	173
+1000	Plano-convex	BK7	095-0230R+1000	173
+1500	Plano-convex	BK7	095-0230R+1500	173
+2000	Plano-convex	BK7	095-0230R+2000	173
+100	Plano-convex	UV FS	095-3230R+100	209
+150	Plano-convex	UV FS	095-3230R+150	209
+200	Plano-convex	UV FS	095-3230R+200	209
+300	Plano-convex	UV FS	095-3230R+300	209
+400	Plano-convex	UV FS	095-3230R+400	209
+500	Plano-convex	UV FS	095-3230R+500	209
+600	Plano-convex	UV FS	095-3230R+600	209
+800	Plano-convex	UV FS	095-3230R+800	209
+1000	Plano-convex	UV FS	095-3230R+1000	209
+1500	Plano-convex	UV FS	095-3230R+1500	209
+2000	Plano-convex	UV FS	095-3230R+2000	209



Most of Metal Coated mirrors are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

Lenses (UV FS, BK7, CaF₂)

PLANO-CONVEX LENSES

FEATURES

- › Positive focal length
- › Converge incident light
- › Form both real and virtual images
- › Very close to the form minimising spherical aberration for infinite conjugate applications

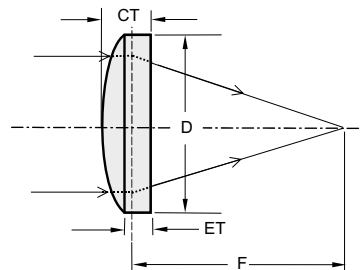
These simplest form lenses have flat surface on one side and spherical surface on the other. They are widely used in telescopes, microscopes, collimators, optical transceivers, magnifiers, condenser systems and eyepieces.

*Upon customer's request, lenses may be anti-reflection coated.
For a required coating, please refer to the **Coatings Section**.*

Standard lenses have a range of focal lengths – from 25 mm to 10000 mm, and diameters – from 12.7 mm to 50.8 mm.



Most of the Lenses are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



SPECIFICATIONS

Material	BK7, UV FS, CaF ₂
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	±0.5 mm
Surface irregularity	λ/8 @ 633 nm
Surface irregularity for CaF ₂	λ/4 @ 633 nm
Concentricity	3 arcmin
Paraxial focal length	BK7 ±2% @ 546 nm
	UV FS ±2% @ 355 nm
	CaF ₂ ±2% @ 2940 nm

Please contact us if you can not find the lens that you need. We can provide a wide range of special focal lengths, diameters and coatings.

BK7 PLANO-CONVEX LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
20.0	12.7	4.5	2.3	10.4	110-0104E	15
25.0	12.7	4.0	2.3	13.0	110-0105E	15
30.0	12.7	3.5	2.1	15.6	110-0106E	15
40.0	12.7	3.0	2.0	20.7	110-0107E	15
50.0	12.7	3.0	2.2	25.9	110-0109E	15
60.0	12.7	3.0	2.3	31.1	110-0111E	15
75.0	12.7	3.0	2.5	38.9	110-0115E	15
100.0	12.7	3.0	2.6	51.9	110-0117E	15
150.0	12.7	3.0	2.7	77.8	110-0121E	15
200.0	12.7	3.0	2.8	103.7	110-0123E	15
250.0	12.7	3.0	2.8	129.7	110-0125E	15
300.0	12.7	3.0	2.9	155.6	110-0126E	15
350.0	12.7	3.0	2.9	181.6	110-0127E	15
500.0	12.7	2.1	2.0	259.4	110-0129E	15
1000.0	12.7	2.1	2.1	518.7	110-0135E	15
1500.0	12.7	2.1	2.1	778.1	110-0145E	15
30.0	25.4	8.5	1.9	15.6	110-0205E	25
40.0	25.4	6.1	1.8	20.7	110-0207E	20
50.0	25.4	5.0	1.7	25.9	110-0209E	19
60.0	25.4	4.4	1.7	31.1	110-0211E	19

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
75.0	25.4	4.0	1.9	38.9	110-0215E	19
90.0	25.4	3.8	2.0	46.7	110-0218E	19
100.0	25.4	3.5	1.9	51.9	110-0219E	19
125.0	25.4	3.2	1.9	64.8	110-0223E	19
150.0	25.4	3.0	2.0	77.8	110-0227E	19
175.0	25.4	3.0	2.1	90.8	110-0229E	18
200.0	25.4	3.0	2.2	103.7	110-0231E	18
250.0	25.4	3.0	2.4	129.7	110-0235E	18
300.0	25.4	3.0	2.5	155.6	110-0239E	18
350.0	25.4	3.0	2.6	181.6	110-0241E	18
400.0	25.4	3.0	2.6	207.5	110-0243E	18
450.0	25.4	3.0	2.7	233.4	110-0245E	18
500.0	25.4	3.0	2.7	259.4	110-0247E	18
550.0	25.4	3.0	2.7	285.3	110-0248E	18
600.0	25.4	3.0	2.7	311.2	110-0249E	18
700.0	25.4	3.0	2.8	363.1	110-0251E	18
800.0	25.4	3.0	2.8	415.0	110-0255E	18
900.0	25.4	3.0	2.8	466.8	110-0257E	18
1000.0	25.4	3.0	2.8	518.7	110-0259E	18
1200.0	25.4	3.0	2.9	622.5	110-0263E	18

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
1250.0	25.4	3.0	2.9	648.4	110-0264E	18
1300.0	25.4	3.0	2.9	674.3	110-0265E	18
1400.0	25.4	3.0	2.9	726.2	110-0266E	18
1500.0	25.4	3.0	2.9	778.1	110-0267E	18
1600.0	25.4	3.0	2.9	830.0	110-0268E	18
1750.0	25.4	3.0	2.9	907.8	110-0269E	18
1900.0	25.4	3.0	2.9	985.6	110-0270E	18
2000.0	25.4	3.0	2.9	1037.4	110-0271E	18
2500.0	25.4	3.0	2.9	1296.8	110-0275E	18
3000.0	25.4	3.0	2.9	1556.2	110-0281E	18
4000.0	25.4	3.0	3.0	2074.9	110-0285E	18
5000.0	25.4	3.0	3.0	2593.6	110-0289E	18
10000.0	25.4	3.0	3.0	5187.2	110-0295E	18
50.0	38.1	12.0	3.7	25.9	110-0405E	37
63.5	38.1	8.0	1.9	32.9	110-0406E	32
75.0	38.1	7.3	2.3	38.9	110-0407E	32
100.0	38.1	6.5	2.9	51.9	110-0409E	29
150.0	38.1	5.1	2.7	77.8	110-0411E	29
200.0	38.1	4.3	2.5	103.7	110-0415E	29
250.0	38.1	4.0	2.6	129.7	110-0417E	29
300.0	38.1	4.0	2.8	155.6	110-0419E	29
350.0	38.1	4.0	3.0	181.6	110-0421E	29
400.0	38.1	4.0	3.1	207.5	110-0423E	29
500.0	38.1	4.0	3.3	259.4	110-0427E	29
700.0	38.1	4.0	3.5	363.1	110-0435E	28
1000.0	38.1	4.0	3.7	518.7	110-0445E	28
2500.0	38.1	4.0	3.8	1296.8	110-0450E	28
5000.0	38.1	4.0	3.9	2593.6	110-0455E	28

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
75.0	50.8	12.3	2.9	38.9	110-0502E	55
100.0	50.8	10.4	3.8	51.9	110-0505E	49
150.0	50.8	7.2	2.9	77.8	110-0507E	46
200.0	50.8	6.1	2.9	103.7	110-0509E	45
250.0	50.8	5.4	2.9	129.7	110-0511E	45
300.0	50.8	5.0	2.9	155.6	110-0515E	45
350.0	50.8	4.7	2.9	181.6	110-0519E	45
400.0	50.8	5.5	3.9	207.5	110-0523E	45
500.0	50.8	5.2	4.0	259.4	110-0525E	45
600.0	50.8	5.0	4.0	311.2	110-0527E	45
650.0	50.8	5.0	4.0	337.2	110-0528E	45
700.0	50.8	5.0	4.1	363.1	110-0529E	45
800.0	50.8	5.0	4.2	415.0	110-0531E	45
1000.0	50.8	5.0	4.4	518.7	110-0535E	45
1500.0	50.8	5.0	4.6	778.1	110-0540E	45
2000.0	50.8	5.0	4.7	1037.4	110-0545E	45
5000.0	50.8	5.0	4.9	2593.6	110-0555E	45
10000.0	50.8	5.0	4.9	5187.2	110-0565E	45
250.0	76.2	12.7	7.0	129.7	110-0711E	120
300.0	76.2	11.7	7.0	155.6	110-0715E	120
400.0	76.2	10.5	7.0	207.5	110-0723E	120
500.0	76.2	9.8	7.0	259.4	110-0725E	120
750.0	76.2	8.9	7.0	389.0	110-0730E	120
1000.0	76.2	8.4	7.0	518.7	110-0735E	120
1500.0	76.2	7.9	7.0	778.1	110-0740E	120
2000.0	76.2	7.7	7.0	1037.4	110-0745E	120
3000.0	76.2	7.5	7.0	1556.2	110-0748E	120

COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

UV FS PLANO-CONVEX LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
25.0	12.7	4.0	2.2	11.9	110-1105E	48
30.0	12.7	3.7	2.2	14.3	110-1106E	48
40.0	12.7	2.5	1.1	19.0	110-1108E	48
50.0	12.7	3.0	2.1	23.8	110-1109E	48
75.0	12.7	3.0	2.4	35.7	110-1111E	48
80.0	12.7	3.5	2.5	38.0	110-1112E	48
90.0	12.7	3.5	3.0	42.8	110-1114E	48
100.0	12.7	3.0	2.6	47.6	110-1115E	48
125.0	12.7	3.0	2.7	59.4	110-1117E	47
150.0	12.7	3.0	2.7	71.3	110-1119E	47
175.0	12.7	3.0	2.8	83.2	110-1121E	47
200.0	12.7	3.0	2.8	95.1	110-1123E	47
250.0	12.7	3.0	2.8	118.9	110-1127E	47
300.0	12.7	3.0	2.9	142.7	110-1129E	47
350.0	12.7	3.0	2.9	166.4	110-1131E	47
400.0	12.7	3.0	2.9	190.2	110-1133E	47
750.0	12.7	3.0	2.9	357.1	110-1141E	47
30.0	25.4	9.75	2.0	14.3	110-1203E	70
40.0	25.4	7.0	2.1	19.0	110-1204E	70
50.0	25.4	6.0	2.3	23.8	110-1205E	70
60.0	25.4	5.0	2.0	28.5	110-1207E	70
75.0	25.4	4.5	2.2	35.7	110-1209E	70
80.0	25.4	4.6	2.4	38.0	110-1210E	70
100.0	25.4	4.0	2.3	47.6	110-1211E	70
125.0	25.4	4.0	2.6	59.4	110-1216E	70
150.0	25.4	4.0	2.9	71.3	110-1217E	65
175.0	25.4	4.0	3.0	83.2	110-1218E	65

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
200.0	25.4	4.0	3.1	95.1	110-1219E	65
250.0	25.4	4.0	3.3	118.9	110-1221E	65
300.0	25.4	4.0	3.4	142.7	110-1223E	65
350.0	25.4	4.0	3.5	166.4	110-1225E	65
400.0	25.4	4.0	3.6	190.2	110-1227E	60
500.0	25.4	4.0	3.7	237.8	110-1233E	60
550.0	25.4	4.0	3.7	261.5	110-1234E	60
600.0	25.4	4.0	3.7	285.3	110-1235E	60
700.0	25.4	4.0	3.8	332.9	110-1238E	60
750.0	25.4	4.0	3.8	356.6	110-1239E	60
800.0	25.4	4.0	3.8	380.4	110-1240E	60
1000.0	25.4	4.0	3.8	475.5	110-1245E	60
1100.0	25.4	4.0	3.8	523.1	110-1246E	60
1500.0	25.4	4.0	3.9	713.3	110-1255E	60
2000.0	25.4	4.0	3.9	951.0	110-1265E	60
5000.0	25.4	4.0	4.0	2377.5	110-1275E	60
50.0	38.1	13.5	3.9	23.8	110-1405E	113
75.0	38.1	8.6	3.1	35.7	110-1409E	113
100.0	38.1	6.9	2.9	47.6	110-1411E	113
150.0	38.1	5.4	2.8	71.3	110-1415E	113
200.0	38.1	4.0	2.1	95.1	110-1419E	113
250.0	38.1	4.0	2.5	118.9	110-1423E	113
300.0	38.1	4.0	2.7	142.7	110-1427E	111
350.0	38.1	4.0	3.0	181.6	110-1421E	111
400.0	38.1	4.0	3.0	190.2	110-1431E	111
500.0	38.1	4.0	3.2	237.8	110-1435E	111
600.0	38.1	4.0	3.4	285.3	110-1439E	111

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
1000.0	38.1	4.0	3.6	475.5	110-1445E	111
1500.0	38.1	4.0	3.7	713.3	110-1455E	111
2500.0	38.1	4.0	3.8	1296.8	110-1450E	111
3000.0	38.1	4.0	3.9	1426.5	110-1465E	111
5000.0	38.1	4.0	3.9	2377.5	110-1475E	111
75.0	50.8	12.2	1.6	35.7	110-1505E	141
100.0	50.8	9.6	2.2	47.6	110-1509E	138
150.0	50.8	6.5	1.8	71.3	110-1511E	138
200.0	50.8	6.0	2.5	95.1	110-1515E	138
250.0	50.8	6.0	3.3	118.9	110-1517E	138
300.0	50.8	6.0	3.7	142.7	110-1519E	138
350.0	50.8	6.0	4.1	166.6	110-1521E	138
400.0	50.8	6.0	4.3	190.2	110-1523E	138
500.0	50.8	6.0	4.6	237.8	110-1527E	138
600.0	50.8	6.0	4.9	285.3	110-1531E	138
700.0	50.8	6.0	5.0	332.9	110-1533E	138
800.0	50.8	6.0	5.2	380.4	110-1535E	138
1000.0	50.8	6.0	5.3	475.5	110-1545E	138
1500.0	50.8	6.0	5.5	713.3	110-1550E	138
2000.0	50.8	6.0	5.7	951.0	110-1555E	138
2500.0	50.8	6.0	5.7	1188.8	110-1565E	138
3000.0	50.8	6.0	5.8	1426.5	110-1564E	138
4000.0	50.8	6.0	5.8	1902.0	110-1566E	138
5000.0	50.8	5.0	4.9	2377.5	110-1567E	138

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
250.0	76.2	9.0	2.7	118.9	110-1717E	350
300.0	76.2	8.0	2.8	142.7	110-1719E	350
500.0	76.2	7.0	3.9	237.8	110-1727E	350
1000.0	76.2	6.0	4.5	475.5	110-1745E	350
1500.0	76.2	6.0	5.0	713.3	110-1750E	350
2000.0	76.2	6.0	5.2	951.0	110-1755E	350

We can supply custom cutting, edging, coating or complete fabrication if required.

Ordering of Coated Lenses

Please choose relevant coating from anti-reflection coatings section (pages 1.5 - 1.6).

The coating code and price should be added to the lens code and price.

Example:

BK7 pl/cx lens Ø12.7 mm, F=1500 mm, coated AR/AR@400-700 nm, AOI=0°

Code: **110-0145E + ARB550**,

Lens code Coating code

Price: 15 + 56 EUR= 71 EUR/pc.



CAF₂ PLANO-CONVEX LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
25.0	12.7	4.1	2.0	10.5	110-5105E	70
50.0	12.7	3.0	2.0	20.9	110-5109E	70
75.0	12.7	2.6	2.0	31.4	110-5111E	70
100.0	12.7	2.5	2.0	41.8	110-5115E	70
150.0	12.7	2.3	2.0	62.7	110-5119E	70
200.0	12.7	2.2	2.0	83.6	110-5123E	70
250.0	12.7	2.2	2.0	104.6	110-5127E	70
500.0	12.7	2.1	2.0	209.1	110-5135E	70
1000.0	12.7	3.0	3.0	418.2	110-5145E	70
40.0	25.4	7.9	2.1	16.7	110-5204E	75
50.0	25.4	7.3	3.0	20.9	110-5205E	75
75.0	25.4	5.7	3.0	31.4	110-5209E	75
100.0	25.4	5.0	3.0	41.8	110-5211E	75
125.0	25.4	5.0	3.4	52.3	110-5213E	75
150.0	25.4	4.3	3.0	62.7	110-5217E	75
200.0	25.4	4.0	3.0	83.6	110-5219E	75
250.0	25.4	3.8	3.0	104.6	110-5221E	75
300.0	25.4	3.7	3.1	125.5	110-5222E	75
400.0	25.4	3.5	3.0	167.3	110-5228E	75
500.0	25.4	3.4	3.0	209.1	110-5223E	75
650.0	25.4	3.3	3.0	271.8	110-5229E	75
750.0	25.4	3.0	2.7	313.7	110-5225E	75
1000.0	25.4	3.2	3.0	418.2	110-5227E	75
1500.0	25.4	3.2	3.1	627.3	110-5235E	75
2000.0	25.4	3.1	3.0	836.5	110-5240E	75
3000.0	25.4	3.1	3.0	1254.7	110-5245E	75

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
75.0	50.8	15.9	2.9	31.4	110-5509E	320
100.0	50.8	11.6	3.0	41.8	110-5511E	280
150.0	50.8	8.4	3.0	62.7	110-5517E	260
200.0	50.8	7.0	3.1	83.6	110-5519E	250
250.0	50.8	5.6	2.5	104.6	110-5520E	250
300.0	50.8	5.6	3.0	125.5	110-5522E	250
400.0	50.8	5.6	3.7	167.3	110-5524E	250
500.0	50.8	5.0	3.5	209.1	110-5523E	250
750.0	50.8	5.0	4.0	313.7	110-5528E	250
1000.0	50.8	5.0	4.2	418.2	110-5535E	250
1500.0	50.8	5.0	4.5	627.3	110-5545E	250
1700.0	50.8	5.0	4.5	711.0	110-5550E	250
2000.0	50.8	5.0	4.6	836.5	110-5555E	250

HOUSING ACCESSORIES

Self-Centering
Lens Mounts
830-0010, 830-0020

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BICONVEX LENSES

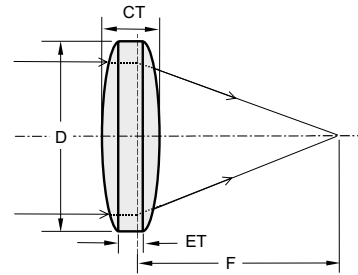
FEATURES

- Have positive focal lengths
- Converge incident light
- Form both real and virtual images
- Minimise spherical aberration as well as cancel coma and distortion at a unit conjugate ratio

Biconvex lenses are all symmetrical, having equal radii on both sides. They are recommended for virtual imaging of real objects and for positive conjugate ratios from 0.2 up to 5. Outside this ratio range plano-convex lenses are usually more suitable. Biconvex lenses are used as magnifiers, objectives, some condensing systems.

Since both surfaces contribute to the power of biconvex lenses, they have shorter focal lengths than plano-convex lenses of equal diameter and surface radius.

*Upon customer's request, lenses may be anti-reflection coated. For a required coating please refer to **Coatings Section**.*



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	±0.5 mm
Surface irregularity	λ/8 @ 633 nm
Concentricity	3 arcmin
Paraxial focal length	BK7 ±2% @ 546 nm
	UV FS ±2% @ 355 nm

Please contact us if you can not find the lens that you need. We can provide a wide range of special focal lengths, diameters and coatings.

BK7 BICONVEX LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
12.7	12.7	4.8	1.3	12.3	111-0104E	16
25.0	12.7	3.5	1.9	25.3	111-0108E	16
40.0	12.7	2.5	1.5	41.1	111-0114E	16
50.0	12.7	2.5	1.7	51.4	111-0116E	16
60.0	12.7	2.5	1.8	61.8	111-0118E	16
75.0	12.7	2.5	2.0	77.4	111-0120E	15
100.0	12.7	2.0	1.6	103.4	111-0124E	15
125.0	12.7	2.0	1.7	129.3	111-0128E	15
150.0	12.7	2.0	1.7	155.3	111-0132E	15
200.0	12.7	2.0	1.8	207.1	111-0136E	15
250.0	12.7	2.0	1.8	259.0	111-0140E	15
300.0	12.7	2.0	1.9	310.9	111-0144E	15
400.0	12.7	2.0	1.9	414.6	111-0148E	15
500.0	12.7	3.0	2.9	518.2	111-0152E	15
25.0	25.4	9.0	1.8	24.3	111-0204E	21
30.0	25.4	7.5	1.8	29.8	111-0206E	21
40.0	25.4	6.0	1.9	40.4	111-0208E	21
50.0	25.4	6.0	2.8	50.8	111-0210E	19
60.0	25.4	4.0	1.4	61.6	111-0214E	19
75.0	25.4	4.0	1.9	77.1	111-0216E	19
100.0	25.4	4.0	2.4	103.1	111-0218E	17
150.0	25.4	4.0	3.0	154.9	111-0222E	17
200.0	25.4	4.0	3.2	206.8	111-0226E	17
250.0	25.4	4.0	3.4	258.7	111-0228E	17
300.0	25.4	4.0	3.5	310.5	111-0229E	17
500.0	25.4	4.0	3.7	518.0	111-0234E	17
700.0	25.4	4.0	3.8	725.5	111-0240E	17
1000.0	25.4	4.0	3.8	1036.8	111-0250E	17

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
50.0	38.1	10.5	3.0	50.0	111-0404E	31
100.0	38.1	6.0	2.4	102.7	111-0410E	31
150.0	38.1	5.0	2.6	154.8	111-0414E	31
200.0	38.1	5.0	3.2	206.6	111-0418E	31
250.0	38.1	5.0	3.6	258.5	111-0422E	31
300.0	38.1	5.0	3.8	310.4	111-0426E	31
400.0	38.1	5.0	4.1	414.1	111-0430E	31
500.0	38.1	5.0	4.3	517.9	111-0434E	30
700.0	38.1	5.0	4.5	725.4	111-0440E	30
1000.0	38.1	5.0	4.6	1036.6	111-0450E	30
50.0	50.8	15.0	0.9	49.2	111-0504E	51
75.0	50.8	10.0	1.3	76.1	111-0508E	48
100.0	50.8	8.5	2.1	102.3	111-0510E	48
150.0	50.8	6.1	1.9	154.6	111-0512E	47
200.0	50.8	5.0	1.9	206.6	111-0514E	47
300.0	50.8	5.0	2.9	310.4	111-0518E	47
400.0	50.8	5.0	3.4	414.1	111-0522E	47
500.0	50.8	5.0	3.8	517.9	111-0526E	47
750.0	50.8	5.0	4.2	777.2	111-0534E	47
1000.0	50.8	5.0	4.4	1036.6	111-0544E	47
1200.0	50.8	5.0	4.5	1244.1	111-0550E	47
5000.0	50.8	5.0	4.9	2593.6	111-0555E	47

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Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
12.7	12.7	6.0	2.0	11.0	111-1104E	49
25.0	12.7	3.5	1.7	23.2	111-1108E	48
50.0	12.7	3.0	2.1	47.1	111-1114E	48
75.0	12.7	2.5	1.9	70.9	111-1118E	48
100.0	12.7	2.3	1.9	94.7	111-1122E	48
150.0	12.7	2.2	1.9	142.3	111-1126E	48
25.0	25.4	10.0	1.9	22.0	111-1204E	71
40.0	25.4	7.1	2.6	36.9	111-1207E	71
50.0	25.4	6.0	2.5	46.6	111-1210E	71
75.0	25.4	4.0	1.7	70.7	111-1214E	65
100.0	25.4	4.0	2.3	94.5	111-1218E	65
150.0	25.4	3.2	2.1	142.1	111-1222E	65
200.0	25.4	3.0	2.1	189.7	111-1226E	65
250.0	25.4	3.0	2.3	237.3	111-1230E	65
300.0	25.4	3.0	2.4	284.8	111-1234E	60
400.0	25.4	3.0	2.6	379.9	111-1238E	60
500.0	25.4	3.0	2.7	475.0	111-1240E	60
750.0	25.4	3.0	2.8	712.8	111-1250E	60
1000.0	25.4	3.0	2.8	950.5	111-1260E	60

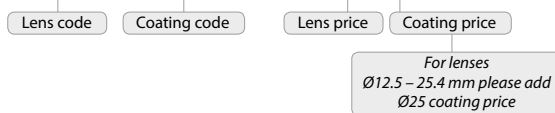
Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
50.0	38.1	11.0	2.7	45.7	111-1404E	116
100.0	38.1	5.0	1.1	94.3	111-1410E	116
150.0	38.1	5.0	2.4	141.8	111-1414E	116
200.0	38.1	5.0	3.1	189.4	111-1418E	116
250.0	38.1	4.0	2.5	237.1	111-1422E	114
300.0	38.1	5.0	3.7	284.5	111-1426E	114
400.0	38.1	5.0	4.0	379.6	111-1430E	114
500.0	38.1	5.0	4.2	474.7	111-1434E	113
700.0	38.1	5.0	4.5	664.9	111-1440E	113
1000.0	38.1	4.7	4.3	950.2	111-1460E	113
50.0	50.8	16.2	1.0	44.8	111-1504E	149
75.0	50.8	10.3	1.1	69.6	111-1508E	148
100.0	50.8	10.0	2.9	93.5	111-1514E	147
150.0	50.8	7.5	3.0	141.4	111-1517E	147
175.0	50.8	6.6	3.0	165.4	111-1520E	147
200.0	50.8	7.0	3.5	189.1	111-1522E	147
250.0	50.8	6.0	3.8	236.8	111-1526E	147
300.0	50.8	6.0	3.7	284.3	111-1530E	146
500.0	50.8	6.0	4.8	474.5	111-1534E	146
1000.0	50.8	6.0	5.4	950.0	111-1550E	146

Ordering of Coated Lenses

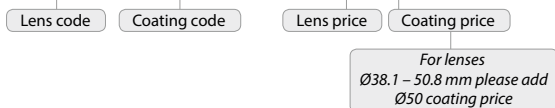
Please choose relevant coating from anti-reflection coatings section (pages 1.5 - 1.6). The coating code and price should be added to the lens code and price.

Example:

1) BK7 bi/cx lens Ø12.7 mm, F=400 mm, coated AR/AR@400-700 nm, AOI=0°
Code: **111-0148E** + **ARB550**, Price: 15 + 56 EUR= 71 EUR/pc.



2) BK7 bi/cx lens Ø38.1 mm, F=1000 mm, coated AR/AR@400-700 nm, AOI=0°
Code: **111-0450E** + **ARB550**, Price: 30 + 67 EUR= 97 EUR/pc.



PLANO-CONCAVE LENSES

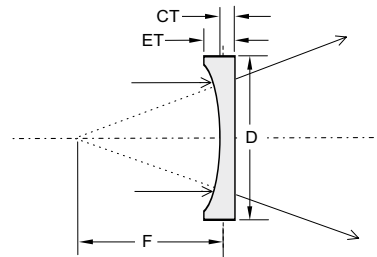
FEATURES

- › Have negative focal lengths
- › Diverge collimated incident light
- › Form only virtual images which are seen through the lens
- › Reduce spherical aberration, coma and distortion at negative-infinite or near-infinite conjugate ratios
- › With the concave surface facing the longest conjugate distance

These lenses are thicker at the edge than in the centre and flat on one side. The plano-concave lenses are used to expand light beams or to increase focal lengths in optical systems. They are often employed for beam expansion of high peak power pulsed lasers. A beam incident on a concave surface will be focused to a point outside the instrument.

Air heating and ionisation at the unwanted focal point are possible with corresponding mode disruption or material damage. To avoid this problem, the input lens should be reversed so that no concave surface faces a parallel beam.

A variety of anti-reflection coatings is available for these lenses. For an appropriate coating, please refer to the **Coatings Section**.



SPECIFICATIONS

Material	BK7, UV FS, CaF ₂
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	±0.5 mm
Surface irregularity	λ/8 @ 633 nm
Surface irregularity for CaF ₂	λ/4 @ 546 nm
Concentricity	3 arcmin
Paraxial focal length	BK7 ±2% @ 546 nm
	UV FS ±2% @ 355 nm
	CaF ₂ ±2% @ 2940 nm



Most of the Lenses are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



Please contact us if you can not find the lens that you need. We can provide a wide range of special focal lengths, diameters and coatings.

BK7 PLANO-CONCAVE LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-25.0	12.7	1.9	3.5	-13.0	112-0105E	14
-50.0	12.7	2.7	3.5	-25.9	112-0109E	14
-60.0	12.7	2.4	3.1	-31.1	112-0112E	14
-75.0	12.7	2.9	3.4	-38.9	112-0115E	14
-100.0	12.7	3.0	3.4	-51.9	112-0117E	14
-125.0	12.7	3.1	3.4	-64.8	112-0119E	14
-150.0	12.7	3.2	3.5	-77.8	112-0121E	14
-200.0	12.7	3.3	3.5	-103.7	112-0123E	14
-250.0	12.7	3.3	3.5	-129.7	112-0125E	14
-300.0	12.7	2.9	3.0	-155.6	112-0127E	14
-30.0	25.4	1.4	7.9	-15.6	112-0205E	18
-40.0	25.4	1.7	5.9	-20.7	112-0207E	18
-50.0	25.4	2.8	6.0	-25.9	112-0209E	18
-75.0	25.4	2.9	4.9	-38.9	112-0215E	17
-100.0	25.4	3.1	4.6	-51.9	112-0219E	17
-125.0	25.4	3.0	4.2	-64.8	112-0223E	17
-150.0	25.4	2.7	3.7	-77.8	112-0227E	17
-200.0	25.4	3.0	3.8	-103.7	112-0231E	17
-250.0	25.4	3.1	3.7	-129.7	112-0235E	17
-300.0	25.4	3.1	3.6	-155.6	112-0239E	17

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-400.0	25.4	3.6	4.0	-207.5	112-0243E	17
-450.0	25.4	3.6	3.9	-233.4	112-0245E	17
-500.0	25.4	3.7	4.0	-259.4	112-0247E	17
-650.0	25.4	3.7	3.9	-337.2	112-0250E	17
-750.0	25.4	3.8	4.0	-389.0	112-0252E	17
-1000.0	25.4	3.8	4.0	-518.7	112-0259E	17
-1500.0	25.4	3.9	4.0	-778.1	112-0260E	17
-2000.0	25.4	3.9	4.0	-1037.4	112-0261E	17
-3000.0	25.4	3.9	4.0	-1556.2	112-0263E	17
-5000.0	25.4	3.9	3.9	-2593.6	112-0265E	17
-100.0	38.1	2.0	5.5	-51.9	112-0409E	28
-150.0	38.1	3.3	5.6	-77.8	112-0411E	28
-200.0	38.1	4.1	5.8	-103.7	112-0415E	28
-300.0	38.1	4.7	5.8	-155.6	112-0419E	28
-75.0	50.8	3.0	12.0	-38.9	112-0502E	55
-100.0	50.8	3.5	10.0	-51.9	112-0505E	49
-125.0	50.8	5.0	10.0	-64.8	112-0506E	48
-150.0	50.8	5.0	9.0	-77.8	112-0507E	46
-200.0	50.8	5.0	8.0	-103.7	112-0509E	45
-250.0	50.8	5.0	7.5	-129.7	112-0511E	45

UV FS PLANO-CONCAVE LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-25.0	12.7	1.3	3.0	-11.9	112-1105E	47
-50.0	12.7	2.2	3.0	-23.8	112-1109E	47
-60.0	12.7	2.4	3.0	-28.5	112-1110E	47
-75.0	12.7	2.5	3.0	-35.7	112-1111E	46
-80.0	12.7	2.6	3.0	-38.0	112-1112E	46
-90.0	12.7	2.6	3.0	-42.8	112-1114E	46
-100.0	12.7	2.7	3.0	-47.6	112-1115E	46
-125.0	12.7	2.7	3.0	-59.4	112-1117E	46
-150.0	12.7	2.7	3.0	-71.3	112-1119E	46
-175.0	12.7	2.8	3.0	-83.2	112-1121E	46
-200.0	12.7	2.8	3.0	-95.1	112-1123E	46
-250.0	12.7	2.8	3.0	-118.9	112-1127E	46
-30.0	25.4	1.6	9.0	-14.3	112-1203E	75
-50.0	25.4	1.9	5.5	-23.8	112-1205E	70
-75.0	25.4	3.1	5.3	-35.7	112-1209E	70
-100.0	25.4	3.0	4.7	-47.6	112-1211E	70
-125.0	25.4	3.0	4.4	-59.4	112-1215E	70
-150.0	25.4	3.1	4.2	-71.3	112-1217E	65

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-200.0	25.4	3.1	4.0	-95.1	112-1219E	65
-250.0	25.4	3.3	4.0	-118.9	112-1221E	65
-300.0	25.4	3.4	4.0	-142.7	112-1223E	65
-400.0	25.4	3.6	4.0	-190.2	112-1227E	60
-500.0	25.4	3.7	4.0	-237.8	112-1233E	60
-750.0	25.4	3.8	4.0	-356.6	112-1239E	60
-1000.0	25.4	3.8	4.0	-475.5	112-1245E	60
-5000.0	25.4	2.0	4.0	-2377.5	112-1255E	60
-100.0	38.1	2.4	6.4	-47.6	112-1411E	110
-150.0	38.1	3.0	5.5	-71.3	112-1415E	110
-200.0	38.1	3.0	4.9	-95.1	112-1419E	110
-300.0	38.1	4.3	5.6	-142.7	112-1427E	110
-100.0	50.8	5.0	11.9	-47.6	112-1509E	138
-150.0	50.8	3.2	7.9	-71.4	112-1512E	138
-250.0	50.8	3.1	5.7	-118.9	112-1517E	138
-300.0	50.8	3.5	5.8	-142.8	112-1519E	138
-500.0	50.8	4.7	6.0	-237.8	112-1527E	138
-2000.0	50.8	5.8	6.0	-951.0	112-1540E	138

CAF₂ PLANO-CONCAVE LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-25.0	12.7	1.9	4.0	-10.5	112-5105E	70
-50.0	12.7	2.0	3.0	-20.9	112-5109E	70
-75.0	12.7	2.4	3.0	-31.4	112-5111E	70
-100.0	12.7	2.5	3.0	-41.8	112-5115E	70
-150.0	12.7	2.7	3.0	-62.7	112-5120E	70
-200.0	12.7	1.8	2.0	-83.6	112-5125E	70
-250.0	12.7	1.8	2.0	-104.6	112-5130E	70
-500.0	12.7	1.9	2.0	-209.1	112-5135E	70
-40.0	25.4	2.5	7.8	-16.7	112-5204E	75
-50.0	25.4	2.7	7.0	-20.9	112-5205E	75
-75.0	25.4	2.8	5.5	-31.4	112-5209E	75
-100.0	25.4	3.0	5.0	-41.8	112-5211E	75
-150.0	25.4	2.7	4.0	-62.7	112-5217E	75
-200.0	25.4	3.0	4.0	-83.6	112-5219E	75
-250.0	25.4	3.2	4.0	-104.6	112-5223E	75
-300.0	25.4	3.4	4.0	-125.5	112-5225E	75
-400.0	25.4	3.5	4.0	-167.3	112-5228E	75
-500.0	25.4	2.6	3.0	-209.1	112-5230E	75
-1000.0	25.4	2.8	3.0	-418.2	112-5235E	75
-200.0	50.8	3.6	7.2	-83.6	112-5519E	180
-300.0	50.8	3.0	5.6	-125.5	112-5525E	180
-500.0	50.8	4.0	5.5	-209.1	112-5530E	180

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Ordering of Coated Lenses

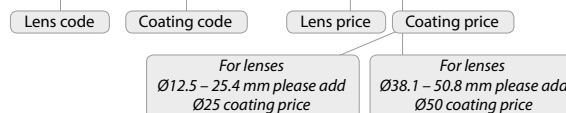
Please choose relevant coating from anti-reflection coatings section (pages 1.5 - 1.6). The coating code and price should be added to the lens code and price.

Example:

BK7 p/cv lens Ø12.7 mm, F=-250 mm, coated AR/AR@400-700 nm, AOI=0°

Code: **112-0125E** + **ARB550**,

Price: 14 + 56 EUR= 70 EUR/pc.



BICONCAVE LENSES

FEATURES

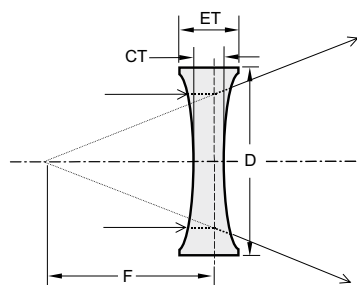
- Have negative focal lengths, diverge collimated incident light
- Form only virtual images which are seen through the lens
- Minimise spherical aberration, coma and distortion at unit conjugate ratio

These lenses are symmetrical, having equal radii on both sides. Biconcave lenses are often used to expand light beams or to increase focal lengths in optical systems, and are normally used in combination with other lenses. Among the many devices utilising biconcave lenses are laser beam expanders, optical character readers, viewers and projection systems.

A variety of anti-reflection coatings is available for these lenses. For appropriate coating, please refer to the **Coatings Section**.



Most of the Lenses are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Thickness tolerance	±0.5 mm
Surface irregularity	λ/8 @ 633 nm
Concentricity	3 arcmin
Paraxial focal length	BK7 ±2% @ 546 nm
	UV FS ±2% @ 355 nm

Please contact us if you can not find the lens that you need. We can provide a wide range of special focal lengths, diameters and coatings.

BK7 BICONCAVE LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-12.7	12.7	3.2	5.5	-13.7	114-0104E	15
-25.0	12.7	2.2	3.2	-26.3	114-0106E	15
-40.0	12.7	2.4	3.1	-41.9	114-0108E	15
-50.0	12.7	2.6	3.1	-52.3	114-0110E	15
-60.0	12.7	2.6	3.0	-62.7	114-0112E	15
-75.0	12.7	2.7	3.0	-78.3	114-0114E	15
-100.0	12.7	2.8	3.0	-104.2	114-0118E	15
-125.0	12.7	1.7	2.0	-130.0	114-0120E	14
-150.0	12.7	1.8	2.0	-155.9	114-0124E	14
-200.0	12.7	1.8	2.0	-207.8	114-0128E	14
-250.0	12.7	1.8	2.0	-259.7	114-0132E	14

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-25.0	25.4	4.8	10.2	-26.7	114-0204E	19
-40.0	25.4	3.0	6.5	-42.0	114-0206E	19
-50.0	25.4	4.5	7.5	-52.6	114-0208E	19
-60.0	25.4	2.8	5.2	-62.7	114-0210E	19
-75.0	25.4	3.7	5.5	-78.4	114-0212E	18
-100.0	25.4	3.2	4.6	-104.3	114-0214E	17
-125.0	25.4	3.1	4.1	-130.2	114-0218E	17
-150.0	25.4	3.0	4.0	-156.1	114-0220E	17
-200.0	25.4	2.8	3.6	-208.0	114-0224E	17
-250.0	25.4	2.9	3.5	-259.9	114-0228E	17
-400.0	25.4	3.2	3.6	-415.5	114-0234E	17
-500.0	25.4	3.2	3.5	-519.3	114-0238E	17

HOUSING ACCESSORIES

Variable Lens Holder 830-0040

Find more at EksmaOptics.com



Ordering of Coated Lenses

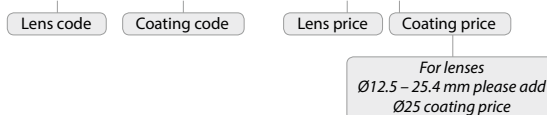
Please choose relevant coating from anti-reflection coatings section (pages 1.5 - 1.6). The coating code and price should be added to the lens code and price.

Example:

BK7 bi/cv lens Ø12.7 mm, F=-250 mm, coated AR/AR@400-700 nm, AOI=0°

Code: **114-0132E** + **ARB550**,

Price: 14 + 56 EUR= 70 EUR/pc.



UV FS BICONCAVE LENSES

Focal length F, mm	Diameter D, mm	Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-12.7	12.7	3.7	6.7	-12.6	114-1104E	49
-25.0	12.7	2.8	4.0	-24.2	114-1108E	49
-30.0	12.7	3.0	4.0	-29.0	114-1110E	49
-50.0	12.7	2.6	3.2	-48.0	114-1114E	49
-75.0	12.7	2.7	3.1	-71.8	114-1118E	49
-100.0	12.7	2.8	3.0	-95.5	114-1122E	47
-25.0	25.4	5.3	12.0	-24.6	114-1204E	71
-30.0	25.4	3.0	7.5	-29.0	114-1205E	71
-50.0	25.4	2.6	6.0	-48.0	114-1208E	71
-75.0	25.4	3.8	6.1	-71.9	114-1212E	71
-100.0	25.4	3.6	5.3	-95.7	114-1216E	71
-150.0	25.4	4.4	5.3	-143.4	114-1220E	71
-200.0	25.4	3.0	3.8	-190.7	114-1224E	70

Please contact us for other size, focus or precision requirements.

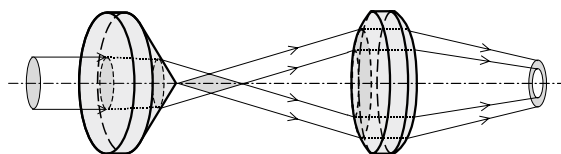
CONICAL LENSES (AXICONS)

FEATURES

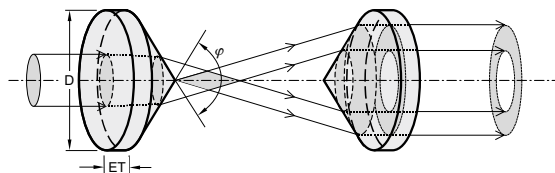
- Precision and standard grade axicons
- Can be made from most optical materials
- Can be supplied with AR and BBAR coatings

We can supply custom cutting, edging, coating or complete fabrication if required. If you cannot find your axicons needed, please send your specification or drawings for a custom quotation.

An axicon with a spherical lens produces an annular focus.



Two axicons together produce a thick-walled hollow "pipe" of light.



PRECISION GRADE PLANO-CONVEX AXICONS

SPECIFICATIONS

Material	UVFS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.1 mm
Edge thickness	3.5 mm
Angle tolerance	±0.05° (±3 arcmin)
Surface irregularity	λ/4 @ 633 nm
Apex rounding	< Ø0.4 mm

Apex angle φ, deg	Diameter D, mm	Edge thickness ET, mm	Centre thickness CT, mm	Catalogue number	Price, EUR
90	25.4	3.5	16.2	131-1290	360
130	25.4	3.5	9.4	131-1230	360
140	25.4	3.5	8.1	131-1240	360
160	25.4	3.5	5.7	131-1260	360
165	25.4	3.5	5.2	131-1265	360
170	25.4	3.5	4.6	131-1270	360
175	25.4	3.5	4.1	131-1275	360
176	25.4	3.5	3.9	131-1276	360
177	25.4	3.5	3.8	131-1277	360
178	25.4	3.5	3.7	131-1278	360
179	25.4	3.5	3.6	131-1279	360
160	50.8	5	9.4	131-1560	685
170	50.8	5	7.2	131-1570	685
176	50.8	5	5.9	131-1576	685
178	50.8	5	5.4	131-1578	685
179	50.8	5	5.2	131-1579	685

HOUSING ACCESSORIES

Universal Adjustable
Lens/Optics Mount
830-0035

Find more at EksmaOptics.com



STANDARD PLANO-CONVEX AXICONS

SPECIFICATIONS

Material	BK7, UV FS
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Angle tolerance	±0.5°
Surface irregularity	1 λ @ 633 nm

Apex angle φ, deg	Diameter D, mm	Edge thickness ET, mm	Centre thickness CT, mm	BK7		UV FS	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
140	25.4	8	12.6	130-0240	160	130-1240	283
160	25.4	8	10.2	130-0260	160	130-1260	283
165	25.4	8	9.7	130-0265	160	130-1265	283
170	25.4	8	9.1	130-0270	160	130-1270	283
175	25.4	8	8.6	130-0275	160	130-1275	283
178	25.4	8	8.2	130-0278	160	130-1278	283

Ordering of Coated Lenses

Please choose relevant coating from anti-reflection coatings section (pages 1.5 - 1.6). The coating code and price should be added to the lens code and price.

Example:

BK7 axicon Ø30 mm, apex 160°, coated AR/AR@400-700 nm, AOI=0°

Code: **130-0360** + **ARB550**,

Price: 197 + 67 EUR= 264 EUR/pc.

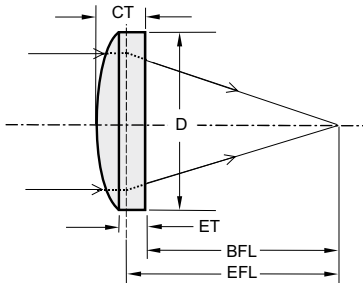
Lens code Coating code

Lens price Coating price

For lenses Ø25.4 mm please add Ø25 coating price

For lenses Ø30 mm please add Ø50 coating price

PRECISION ASPHERICAL LENSES



Aspherical lenses are designed to reduce spherical aberration. Complex multi-lens systems designed for compensation of spherical aberration can often be replaced with a single aspheric lens. We can produce aspherical lenses of custom design using your drawings or specifications in our CNC lens polishing facility.

SPECIFICATIONS

Standard material [Refractive index]	N-BK7 [1.517] S-LAH64 [1.788] UVFS [1.453]
Design wavelength	780 nm
Surface quality	40 – 20 scratch & dig (uncoated)
Clear aperture	>90% of diameter
Diameter tolerance	+0.0 / -0.05 mm
Bevel	0.3 mm max @ 45°
Center thickness tolerance	≤0.05 mm
EFL tolerance	≤0.1%
Asphere figure error P-V	±1 μm
Surface form deviation RMS	≤0.5 μm

Substrate	D, mm	EFL, mm	BFL, mm	CT, mm	CA, mm	NA	Catalogue number	Price, EUR
S-LAH64	12.5	10	7.6	4.3	11.3	0.544	116-1210	130
N-BK7	12.5	25	22.4	4.0	11.3	0.227	115-1225	130
UVFS	12.7	40	36.2	5.5	11.4	0.144	117-1240	245
S-LAH64	25	20	15.7	7.6	22.5	0.543	116-2520	170
N-BK7	25	50	46	6.0	22.5	0.232	115-2550	170
N-BK7	25	32	27.4	7.0	22.5	0.359	115-2532	170
UVFS	25.4	30	24.5	8.0	22.9	0.398	117-2530	320
UVFS	25.4	40	35.9	6.0	22.9	0.292	117-2540	320
UVFS	25.4	50	46.6	5.0	22.9	0.232	117-2550	320
UVFS	25.4	60	56.6	5.0	22.9	0.192	117-2560	320
S-LAH64	50	40	31.3	15.5	45.0	0.554	116-5040	310
N-BK7	50	100	93.4	10.0	45.0	0.237	115-5100	310

PLANO-CYLINDRICAL LENSES

FEATURES

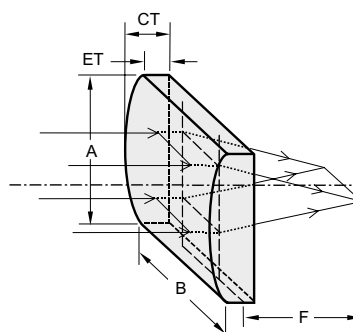
- Condense or expand light in one dimension only
- Ideal for producing line images, for scanning and projection

We offer a selection of cylindrical lenses that are either plano-convex or plano-concave in form and rectangular in shape. These lenses are used to focus light to a thin line in laser scanners, spectroscopy, dye lasers, acousto-optics, optical processors and other similar applications. They are the best for circularisation of diode laser outputs, energy collection for linear detectors or for coupling to a slit input.

Earlier remarks made about plano-convex and plano-concave spherical lenses with regard to aberrations and conjugate ratios are also applicable to cylindrical lenses.

*A variety of anti-reflection coatings is available for these lenses.
For an appropriate coating, please refer to the **Coatings Section**.*

Please contact us for other size, focus or precision requirements.
We can supply custom cutting, edging, coating or complete fabrication if required.



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Size tolerance	±0.5 mm
Thickness tolerance	±0.5 mm
Surface irregularity	$\lambda/4$ @ 633 nm
Paraxial focal length	BK7 ±2% @ 546 nm
	UV FS ±2% @ 355 nm

BK7 PLANO-CONVEX CYLINDRICAL LENSES

Focal length F, mm	Dimensions		Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
	A, mm	B, mm					
15	12.7	12.7	4.8	1.5	7.8	120-0105E	40
25	19.1	25.4	6.1	2.0	13.0	120-0110E	60
25	25.4	25.4	14	2.5	13.0	120-0202E	60
30	25.4	25.4	8.5	2.0	15.6	120-0201E	60
40	25.4	25.4	6.4	2.0	20.7	120-0203E	60
50	25.4	25.4	5.2	2.0	25.9	120-0204E	55
50	25.4	50.8	5.2	2.0	25.9	120-0205E	85
75	25.4	25.4	4.1	2.0	38.9	120-0209E	55
75	25.4	50.8	4.1	2.0	38.9	120-0210E	85
100	25.4	25.4	3.5	2.0	51.9	120-0214E	55
100	25.4	50.8	3.5	2.0	51.9	120-0215E	85
150	25.4	25.4	3.0	2.0	77.8	120-0219E	55
150	25.4	50.8	3.0	2.0	77.8	120-0220E	85
200	25.4	25.4	2.8	2.0	103.7	120-0224E	55
200	25.4	50.8	2.8	2.0	103.7	120-0225E	85
300	25.4	25.4	2.5	2.0	155.6	120-0229E	55
300	25.4	50.8	2.5	2.0	155.6	120-0230E	85
500	25.4	25.4	2.4	2.0	259.4	120-0234E	59
500	25.4	50.8	2.4	2.0	259.4	120-0235E	95
1000	25.4	25.4	2.3	2.0	518.7	120-0239E	59
1000	25.4	50.8	2.3	2.0	518.7	120-0240E	95
1500	25.4	25.4	2.2	2.0	778.1	120-0244E	59
1500	25.4	50.8	2.2	2.0	778.1	120-0245E	95

UV FS PLANO-CONVEX CYLINDRICAL LENSES

Focal length F, mm	Dimensions		Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
	A, mm	B, mm					
15	12.7	12.7	4.9	2.0	7.1	120-1104E	69
25	19.1	25.4	8.0	3.0	11.9	120-1105E	97
30	25.4	25.4	10.0	2.5	14.3	120-1201E	97
40	25.4	25.4	8.0	3.1	19.0	120-1203E	97
50	25.4	25.4	7.1	3.5	23.8	120-1204E	95
50	25.4	50.8	7.1	3.5	23.8	120-1205E	170
75	25.4	25.4	5.6	3.3	35.7	120-1209E	91
75	25.4	50.8	5.6	3.3	35.7	120-1210E	170
100	25.4	25.4	4.7	3.0	47.6	120-1214E	87
100	25.4	50.8	4.7	3.0	47.6	120-1215E	161
150	25.4	25.4	4.1	3.0	71.3	120-1219E	87
150	25.4	50.8	4.1	3.0	71.3	120-1220E	161
200	25.4	25.4	4.3	3.5	95.1	120-1224E	87
200	25.4	50.8	4.3	3.5	95.1	120-1225E	161
250	25.4	25.4	4.2	3.5	118.9	120-1226E	87
250	25.4	50.8	4.2	3.5	118.9	120-1227E	161
300	25.4	25.4	4.1	3.5	142.7	120-1229E	87
300	25.4	50.8	4.1	3.5	142.7	120-1230E	161
500	25.4	25.4	3.8	3.5	237.8	120-1234E	95
500	25.4	50.8	3.8	3.5	237.8	120-1235E	177
1000	25.4	25.4	2.5	2.3	475.5	120-1239E	95
1000	25.4	50.8	2.5	2.3	475.5	120-1240E	177
1500	25.4	25.4	2.2	2.0	713.3	120-1244E	95
1500	25.4	50.8	2.2	2.0	713.3	120-1245E	177

BK7 PLANO-CONCAVE CYLINDRICAL LENSES

Focal length F, mm	Dimensions		Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
	A, mm	B, mm					
-15	12.7	12.7	1.4	3.7	-7.8	122-0105E	40
-25	19.1	25.4	2.0	6.0	-13.0	122-0110E	60
-50	25.4	25.4	2.0	5.2	-25.9	122-0204E	55
-50	25.4	50.8	2.0	5.2	-25.9	122-0205E	85
-75	25.4	25.4	2.0	4.1	-38.9	122-0209E	55
-75	25.4	50.8	2.0	4.1	-38.9	122-0210E	85
-100	25.4	25.4	2.0	3.5	-51.9	122-0214E	55
-100	25.4	50.8	2.0	3.5	-51.9	122-0215E	85
-150	25.4	25.4	2.0	3.0	-77.8	122-0219E	55
-150	25.4	50.8	2.0	3.0	-77.8	122-0220E	85
-200	25.4	25.4	2.0	2.8	-103.7	122-0224E	55
-200	25.4	50.8	2.0	2.8	-103.7	122-0225E	85
-250	25.4	25.4	2.0	2.7	-129.7	122-0226E	55
-250	25.4	50.8	2.0	2.7	-129.7	122-0227E	85
-300	25.4	25.4	2.0	2.5	-155.6	122-0229E	55
-300	25.4	50.8	2.0	2.5	-155.6	122-0230E	85
-500	25.4	25.4	2.0	2.4	-259.4	122-0234E	59
-500	25.4	50.8	2.0	2.4	-259.4	122-0235E	95

UV FS PLANO-CONCAVE CYLINDRICAL LENSES

Focal length F, mm	Dimensions		Centre thickness CT, mm	Edge thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
	A, mm	B, mm					
-15	12.7	12.7	2.0	4.9	-7.1	122-1104E	69
-25	19.1	25.4	3.0	8.0	-11.9	122-1105E	97
-30	25.4	25.4	2.5	10.0	-14.3	122-1201E	97
-50	25.4	25.4	3.5	7.1	-23.8	122-1204E	95
-50	25.4	50.8	3.5	7.1	-23.8	122-1205E	199
-75	25.4	25.4	3.3	5.6	-35.7	122-1209E	95
-75	25.4	50.8	3.3	5.6	-35.7	122-1210E	199
-100	25.4	25.4	3.0	4.7	-47.6	122-1214E	95
-100	25.4	50.8	3.0	4.7	-47.6	122-1215E	199
-150	25.4	25.4	3.0	4.1	-71.3	122-1219E	95
-150	25.4	50.8	3.0	4.1	-71.3	122-1220E	199
-200	25.4	25.4	3.8	4.6	-95.1	122-1224E	95
-200	25.4	50.8	3.8	4.6	-95.1	122-1225E	199
-300	25.4	25.4	3.5	4.1	-142.7	122-1229E	95
-300	25.4	50.8	3.5	4.1	-142.7	122-1230E	199
-500	25.4	25.4	3.5	3.8	-237.8	122-1234E	113
-500	25.4	50.8	3.5	3.8	-237.8	122-1235E	209

COATINGS

WINDOWS & FILTERS

MIRRORS

Ordering of Coated Lenses

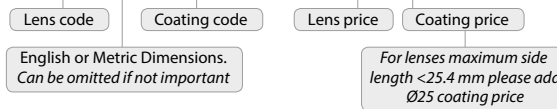
Please choose relevant coating from anti-reflection coatings section (pages 1.5 - 1.6). The coating code and price should be added to the lens code and price.

Example:

BK7 pl/cx cylindrical lens, dimensions: 10×10 mm, F = 15 mm, coated AR/AR @ 400-700 nm, AOI=0°

Code: **120-0105 E + ARB550**,

Price: 40 + 56 EUR= 96 EUR/pc.



LENSES

HOUSING ACCESSORIES

Rectangular
Optics
Holders
830-0100,
830-0110

Find more at
EksmaOptics.com



For applications where fine adjustment is required, use Prism Holders
840-0160, 840-0170

Find more at EksmaOptics.com



PRISMS

POLARIZING OPTICS

UV & IR OPTICS

LENS KITS



Lens kits contain different types (plano-convex, biconvex, plano-concave, biconcave) of Ø25.4 mm lenses with various focal lengths. Kits are packed into foam lined plastic the new plastic boxes for safe handling and storage.

Large lens kit consists of 40 lenses and small lens kit consists of 15 lenses made either of N-BK7 glass or UVFS. Kits are available uncoated, as well as BBAR coated or with AR coatings for particular laser wavelengths.

SPHERICAL N-BK7 LENS KITS



Small Lens Kit

Please refer to Nd:YAG Laser Line (see page 3.12) or Femtoline (see page 4.18) section for lens kits with AR coated lenses for particular laser applications.

SMALL KIT OF 15 PCS. N-BK7 lenses

Coating	Catalogue number	Price, EUR
uncoated	140-0215	310
BBAR @ 400 – 700 nm, R<0.9%	140-0215-AR400-700	990
BBAR @ 650 – 1100 nm, R<1.0%	140-0215-AR650-1100	1050
BBAR @ 1050 – 1700 nm, R<1.0%	140-0215-AR1050-1700	1150
AR @ 532 + 1064 nm, R<0.5%	140-0215-AR532+1064	770
AR @ 1064 nm, R<0.25%	140-0215-AR1064	700
AR @ 532 nm, R<0.25%	140-0215-AR532	700

Small BK7 Lens Kit

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	30	110-0205E
pl/cx	25.4	40	110-0207E
pl/cx	25.4	50	110-0209E
pl/cx	25.4	60	110-0211E
pl/cx	25.4	75	110-0215E
pl/cx	25.4	100	110-0219E
pl/cx	25.4	150	110-0227E
pl/cx	25.4	200	110-0231E

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	500	110-0247E
pl/cx	25.4	1000	110-0259E
pl/cv	25.4	-40	112-0207E
pl/cv	25.4	-50	112-0209E
pl/cv	25.4	-75	112-0215E
pl/cv	25.4	-100	112-0219E
pl/cv	25.4	-150	112-0227E

LARGE KIT OF 40 PCS. N-BK7 lenses

Coating	Catalogue number	Price, EUR
uncoated	140-0240	780
BBAR @ 400 – 700 nm, R<0.9%	140-0240-AR400-700	1820
BBAR @ 650 – 1100 nm, R<1.0%	140-0240-AR650-1100	1930
BBAR @ 1050 – 1700 nm, R<1.0%	140-0240-AR1050-1700	2030
AR @ 532 + 1064 nm, R<0.5%	140-0240-AR532+1064	1750
AR @ 1064 nm, R<0.25%	140-0240-AR1064	1550
AR @ 532 nm, R<0.25%	140-0240-AR532	1550

Large BK7 Lens Kit

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	30	110-0205E
pl/cx	25.4	40	110-0207E
pl/cx	25.4	50	110-0209E
pl/cx	25.4	60	110-0211E
pl/cx	25.4	75	110-0215E
pl/cx	25.4	100	110-0219E
pl/cx	25.4	125	110-0223E
pl/cx	25.4	150	110-0227E
pl/cx	25.4	200	110-0231E
pl/cx	25.4	250	110-0235E
pl/cx	25.4	300	110-0239E
pl/cx	25.4	350	110-0241E
pl/cx	25.4	400	110-0243E
pl/cx	25.4	500	110-0247E

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	700	110-0251E
pl/cx	25.4	1000	110-0259E
bi/cx	25.4	25	111-0204E
bi/cx	25.4	30	111-0206E
bi/cx	25.4	40	111-0208E
bi/cx	25.4	50	111-0210E
bi/cx	25.4	60	111-0214E
bi/cx	25.4	75	111-0216E
bi/cx	25.4	100	111-0218E
bi/cx	25.4	150	111-0222E
bi/cx	25.4	200	111-0226E
bi/cx	25.4	250	111-0228E
bi/cx	25.4	500	111-0234E

Type	Dia, mm	F, mm	Catalogue nr.
bi/cx	25.4	1000	111-0250E
pl/cv	25.4	-40	112-0207E
pl/cv	25.4	-50	112-0209E
pl/cv	25.4	-75	112-0215E
pl/cv	25.4	-100	112-0219E
pl/cv	25.4	-150	112-0227E
pl/cv	25.4	-200	112-0231E
bi/cv	25.4	-25	114-0204E
bi/cv	25.4	-50	114-0208E
bi/cv	25.4	-75	114-0212E
bi/cv	25.4	-100	114-0214E
bi/cv	25.4	-150	114-0220E
bi/cv	25.4	-200	114-0224E

SPHERICAL UV FS LENS KITS



Large Lens Kit

RELATED PRODUCTS

Tweezers/Forceps
for Optical
Components 260-1050
See page A.4



SMALL KIT OF 15 PCS. UV FS lenses

Coating	Catalogue number	Price, EUR
uncoated	140-1215	930
BBAR @ 210 – 400 nm, R<2%	140-1215-AR210-400	1830
BBAR @ 350 – 900 nm, R<1.5%	140-1215-AR350-900	1660
BBAR @ 760 – 840 nm, R<0.4%	140-1215-AR760-840	1530
BBAR @ 700 – 900 nm, R<0.8%	140-1215-AR700-900	1610
BBAR @ 650 – 1100 nm, R<1%	140-1215-AR650-1100	1670
AR @ 532 + 1064 nm, R<0.5%	140-1215-AR532+1064	1390
AR @ 1064 nm, R<0.25%	140-1215-AR1064	1320
AR @ 532 nm, R<0.25%	140-1215-AR532	1320
AR @ 355 nm, R<0.25%	140-1215-AR355	1350
AR @ 266 nm, R<0.4%	140-1215-AR266	1380
AR @ 1030 nm, R<0.25%	140-1215-AR1030	1320
AR @ 515 nm, R<0.25%	140-1215-AR515	1320
AR @ 343 nm, R<0.3%	140-1215-AR343	1350
AR @ 258 nm, R<0.4%	140-1215-AR258	1380

Small UV FS Lens Kit

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	30	110-1203E
pl/cx	25.4	50	110-1205E
pl/cx	25.4	75	110-1209E
pl/cx	25.4	100	110-1211E
pl/cx	25.4	125	110-1216E
pl/cx	25.4	150	110-1217E
pl/cx	25.4	200	110-1219E
pl/cx	25.4	300	110-1223E

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	500	110-1233E
pl/cx	25.4	1000	110-1245E
pl/cv	25.4	-50	112-1205E
pl/cv	25.4	-75	112-1209E
pl/cv	25.4	-100	112-1211E
pl/cv	25.4	-125	112-1215E
pl/cv	25.4	-150	112-1217E

LARGE KIT OF 40 PCS. UV FS lenses

Coating	Catalogue number	Price, EUR
uncoated	140-1240	2160
BBAR @ 210 – 400 nm, R<2%	140-1240-AR210-400	3490
BBAR @ 350 – 900 nm, R<1.5%	140-1240-AR350-900	3290
BBAR @ 760 – 840 nm, R<0.4%	140-1240-AR760-840	3040
BBAR @ 700 – 900 nm, R<0.8%	140-1240-AR700-900	3210
BBAR @ 650 – 1100 nm, R<1%	140-1240-AR650-1100	3310
AR @ 532 + 1064 nm, R<0.5%	140-1240-AR532+1064	3130
AR @ 1064 nm, R<0.25%	140-1240-AR1064	2930
AR @ 532 nm, R<0.25%	140-1240-AR532	2930
AR @ 355 nm, R<0.25%	140-1240-AR355	3030
AR @ 266 nm, R<0.4%	140-1240-AR266	3130
AR @ 1030 nm, R<0.25%	140-1240-AR1030	2930
AR @ 515 nm, R<0.25%	140-1240-AR515	2930
AR @ 343 nm, R<0.3%	140-1240-AR343	3030
AR @ 258 nm, R<0.4%	140-1240-AR258	3130

Large UV FS Lens Kit

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	30	110-1203E
pl/cx	25.4	50	110-1205E
pl/cx	25.4	75	110-1209E
pl/cx	25.4	80	110-1210E
pl/cx	25.4	100	110-1211E
pl/cx	25.4	125	110-1216E
pl/cx	25.4	150	110-1217E
pl/cx	25.4	200	110-1219E
pl/cx	25.4	250	110-1221E

Type	Dia, mm	F, mm	Catalogue nr.
pl/cx	25.4	300	110-1223E
pl/cx	25.4	350	110-1225E
pl/cx	25.4	400	110-1227E
pl/cx	25.4	500	110-1233E
pl/cx	25.4	600	110-1235E
pl/cx	25.4	750	110-1239E
pl/cx	25.4	1000	110-1245E
bi/cx	25.4	25	111-1204E
bi/cx	25.4	40	111-1207E

COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

Type	Dia, mm	F, mm	Catalogue nr.
bi/cx	25.4	50	111-1210E
bi/cx	25.4	75	111-1214E
bi/cx	25.4	100	111-1218E
bi/cx	25.4	150	111-1222E
bi/cx	25.4	200	111-1226E
bi/cx	25.4	250	111-1230E
bi/cx	25.4	300	111-1234E
bi/cx	25.4	400	111-1238E
bi/cx	25.4	500	111-1240E
bi/cx	25.4	1000	111-1260E
pl/cv	25.4	-50	112-1205E

Type	Dia, mm	F, mm	Catalogue nr.
pl/cv	25.4	-75	112-1209E
pl/cv	25.4	-100	112-1211E
pl/cv	25.4	-150	112-1217E
pl/cv	25.4	-200	112-1219E
pl/cv	25.4	-300	112-1223E
bi/cv	25.4	-25	114-1204E
bi/cv	25.4	-50	114-1208E
bi/cv	25.4	-75	114-1212E
bi/cv	25.4	-100	114-1216E
bi/cv	25.4	-150	114-1220E
bi/cv	25.4	-200	114-1224E

CYLINDRICAL N-BK7 LENS KIT

CYLINDRICAL LENS KIT OF 12 PCS. N-BK7 lenses

Coating	Catalogue number	Price, EUR
uncoated	140-0212	950
BBAR @ 400 – 700 nm, R<0.9%	140-0212-AR400-700	1750
BBAR @ 650 – 1100 nm, R<0.7%	140-0212-AR650-1100	1815
BBAR @ 1050 – 1700 nm, R<0.7%	140-0212-AR1050-1700	2020
AR @ 1064 nm, R<0.25%	140-0212-AR1064	1550
AR @ 532 + 1064 nm, R<0.5%	140-0212-ARD1064	1620

Cylindrical N-BK7 lens kit

Type	Size, mm	F, mm	Catalogue nr.
pl/cx	25.4 x 50.8	50	120-0205E
pl/cx	25.4 x 50.8	75	120-0210E
pl/cx	25.4 x 50.8	100	120-0215E
pl/cx	25.4 x 50.8	150	120-0220E
pl/cx	25.4 x 50.8	200	120-0225E
pl/cx	25.4 x 50.8	300	120-0230E
pl/cx	25.4 x 50.8	500	120-0235E

Type	Size, mm	F, mm	Catalogue nr.
pl/cx	25.4 x 50.8	1000	120-0240E
pl/cv	25.4 x 50.8	-50	122-0205E
pl/cv	25.4 x 50.8	-75	122-0210E
pl/cv	25.4 x 50.8	-100	122-0215E
pl/cv	25.4 x 50.8	-150	122-0220E

CYLINDRICAL UV FS LENS KIT

CYLINDRICAL LENS KIT OF 12 PCS. UV FS lenses

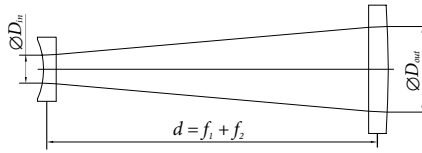
Coating	Catalogue number	Price, EUR
uncoated	140-1212	1700
BBAR @ 210 – 400 nm, R<2%	140-0212-ARB300	2720
BBAR @ 350 – 900 nm, R<1.5%	140-0212-ARB625	2630
BBAR @ 700 – 900 nm, R<0.5%	140-0212-ARB800	2500
BBAR @ 700 – 900 nm, R<0.1%	140-0212-ARB800HT	3400
BBAR @ 650 – 1100 nm, R<0.7%	140-0212-ARB825	2550
BBAR @ 900 – 1100 nm, R<0.1%	140-0212-ARB1000HT	3400
AR @ 515 + 1030 nm, R<0.5%	140-0212-ARD1030	2370
AR @ 515 + 1030 nm, R<0.1%	140-0212-ARD1030HT	3300
AR @ 1000 – 1060 nm, R<0.3%	140-0212-AR1030	2300

Cylindrical UV FS lens kit

Type	Size, mm	F, mm	Catalogue nr.
pl/cx	25.4 x 50.8	50	120-1205E
pl/cx	25.4 x 50.8	75	120-1210E
pl/cx	25.4 x 50.8	100	120-1215E
pl/cx	25.4 x 50.8	150	120-1220E
pl/cx	25.4 x 50.8	200	120-1225E
pl/cx	25.4 x 50.8	300	120-1230E

Type	Size, mm	F, mm	Catalogue nr.
pl/cx	25.4 x 50.8	500	120-1235E
pl/cx	25.4 x 50.8	1000	120-1240E
pl/cv	25.4 x 50.8	-50	122-1205E
pl/cv	25.4 x 50.8	-75	122-1210E
pl/cv	25.4 x 50.8	-100	122-1215E
pl/cv	25.4 x 50.8	-150	122-1220E

SIMPLE TELESCOPE KIT



The distance from the second lens to the focal point of the combined lenses is called the back focal length (BFL).

$$BFL = \frac{f_2 \cdot (d - f_1)}{d - (f_1 + f_2)}$$

If the separation distance is equal to the sum of the focal lengths ($d = f_1 + f_2$), the combined focal length and BFL are infinite. This corresponds to a pair of lenses that transform a parallel (collimated) beam into another collimated beam. This type of system is called

an afocal system, since it produces no net convergence or divergence of the beam. Two lenses at this separation form the simplest type of optical telescope. Although the system does not alter the divergence of a collimated beam, it does alter the width of the beam. The magnification of such a telescope is given by

$$M = -\frac{f_2}{f_1} = \frac{D_{out}}{D_{in}} \frac{(\text{exit diameter})}{(\text{input diameter})}$$

which is the ratio of the input beam width to the output beam width. Note the sign convention: a telescope with two convex lenses ($f_1 > 0, f_2 > 0$) produces a negative magnification, indicating an inverted image. A concave plus a convex lens ($f_1 < 0 < f_2$) produces a positive magnification and the image is upright.

Simple lenses are subject to optical aberrations. In many cases these aberrations can be compensated for to a great extent by using a combination of simple lenses with complementary aberrations. A compound lens is a collection of simple lenses of different shapes and made of materials of different refractive indices, arranged one after the other with a common axis.

If two thin lenses are separated in air by some distance d (where d is smaller than the focal length of the first lens), the focal length for the combined system is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 \cdot f_2}$$

Coating	Material	Catalogue number	Price, EUR
Uncoated	BK7	140-0008	771
1064 nm, R<0.2%	BK7	141-0008	1075
532 nm + 1064 nm, R<0.5%	BK7	142-0008	1110
400 – 700 nm, R<0.9%	BK7	147-0008	1260
Uncoated	UV FS	140-1008	1170
266 nm, R<0.4%	UV FS	144-1008	1470
266 nm + 355 nm, R<0.6%	UV FS	149-1008	1480
210 – 400 nm, R<1.5%	UV FS	146-1008	1680
355 nm, R<0.25%	UV FS	143-1008	1465
532 nm + 1064 nm, R<0.5%	UV FS	141-1008	1485
350 – 900 nm, R<1.5%	UV FS	145-1008	1685
650 – 950 nm, R<1%	UV FS	148-1008	1645

Any other antireflection coating wavelength region is available on request.

Each kit includes 8 lenses, Aluminium Optical Rail 810-0005-02, two Aluminium Rail Carriers 810-0007-06, Self Centering Lens Mounts 830-0010 and 830-0020, two Rod Holders 820-0050-02 and two Rods 820-0010-02. Net weight: 1.4 kg

SIMPLE TELESCOPE KIT

Material: BK7		Material: UV FS		Focal length f_1 , mm	Focal length f_2 , mm	Distance between lenses $d=f_1+f_2$, mm *	Magnification, M
Lens 1	Lens 2	Lens 1	Lens 2				
BK7 bi/cv Ø12.7 mm	BK7 pl/cx Ø50.8 mm	UV FS bi/cv Ø12.7 mm	UV FS pl/cx Ø50.8 mm	-12.7	+75	62	5.9
114-0104	110-0502	114-1104	110-1505		+100	87	7.7
	110-0505		110-1509		+150	137	11.8
	110-0507		110-1511		+200	187	15.7
	110-0509		110-1515		+250	237	19.7
	110-0511		110-1517				
BK7 bi/cv Ø25.4 mm	BK7 pl/cx Ø50.8 mm	UV FS bi/cv Ø25.4 mm	UV FS pl/cx Ø50.8 mm	-25	+75	50	3
114-0204	110-0502	114-1204	110-1505		+100	75	4
	110-0505		110-1509		+150	125	6
	110-0507		110-1511		+200	175	8
	110-0509		110-1515		+250	225	10
	110-0511		110-1517				
BK7 pl/cv Ø25.4 mm	BK7 pl/cx Ø50.8 mm	UV FS pl/cv Ø25.4 mm	UV FS pl/cx Ø50.8 mm	-50	+75	25	1.5
112-0209	110-0502	112-1205	110-1505		+100	50	2
	110-0505		110-1509		+150	100	3
	110-0507		110-1511		+200	150	4
	110-0509		110-1515		+250	200	5
	110-0511		110-1517				

* Note that distance between lenses d is the distance between focal planes of the lenses and is given theoretically (the thickness of lenses is not included into calculation). It, also, depends on wavelength. The distance should be adjusted ± 10 mm in each particular case.

Prisms

WEDGE PRISMS

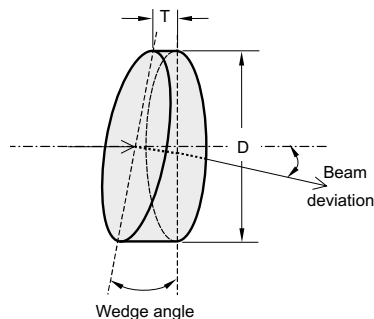
FEATURES

- Steer beams in optical systems
- Can be used in pairs for continuous angular adjustment

Having selected an appropriate wedge, it is easy to create a precise beam deviation without affecting other beam parameters. If two wedges are used together with the sloping surfaces in close proximity, it is possible to produce a continuous variation of beam deviation by counter – rotating the wedges.

Wedge prisms are made from alternative materials, such as UV grade fused silica, and different shapes and sizes or with various anti-reflection coatings.

Contact us for other types of prisms
e.g. trapezoidal, various isosceles, Dove, Amici, Penta, etc.



SPECIFICATIONS

Material	BK7, UV FS
Clear aperture	90% of the diameter
Diameter tolerance	+0.00 / -0.12 mm
Wedge tolerance	±3 arcmin

STANDARD WEDGE PRISMS

Surface quality: 40 – 20 scratch & dig (MIL-PRF-13830B). Surface flatness: $\lambda/4$ @ 633 nm.

MATERIAL: BK7

Wedge, deg	Beam Deviation, deg		Ø12.7 × 3 mm		Ø25.4 × 3 mm	
	@ 1064	@ 532	Catalogue number	Price, EUR	Catalogue number	Price, EUR
0.5	0.25	0.26	310-0100E	25	310-0200E	30
1	0.51	0.52	310-0101E	25	310-0201E	30
2	1.01	1.04	310-0102E	25	310-0202E	30
3	1.52	1.56	310-0103E	25	310-0203E	30
5	2.54	2.60	310-0105E	25	310-0205E	30

MATERIAL: UV FS

Wedge, deg	Beam Deviation, deg			Ø12.7 × 3 mm		Ø25.4 × 3 mm	
	@ 1064	@ 532	@ 355	Catalogue number	Price, EUR	Catalogue number	Price, EUR
0.5	0.22	0.23	0.24	310-1100E	40	310-1200E	50
1	0.45	0.46	0.48	310-1101E	40	310-1201E	50
2	0.90	0.92	0.95	310-1102E	40	310-1202E	50
3	1.35	1.38	1.43	310-1103E	40	310-1203E	50
5	2.26	2.31	2.39	310-1105E	40	310-1205E	50



Most of the Prisms
are available for fast
off-the-shelf delivery.
Check the availability at
www.eksmaoptics.com



PRECISION WEDGE PRISMS

Surface quality: 20 – 10 scratch & dig (MIL-PRF-13830B). Surface flatness: $\lambda/10$ @ 633 nm.

MATERIAL: BK7

Wedge, deg	Beam Deviation, deg		Ø12.7 × 6 mm		Ø25.4 × 6 mm	
	@ 1064	@ 532	Catalogue number	Price, EUR	Catalogue number	Price, EUR
0.5	0.25	0.26	311-0100E	35	311-0200E	45
1	0.51	0.52	311-0101E	35	311-0201E	45
2	1.01	1.04	311-0102E	35	311-0202E	45
3	1.52	1.56	311-0103E	35	311-0203E	45
5	2.54	2.60	311-0105E	35	311-0205E	45

HOUSING ACCESSORIES

Stable Steel Mirror/Beamsplitter Mount 840-0036

Find more at EksmaOptics.com



MATERIAL: UV FS

Wedge, deg	Beam Deviation, deg			Ø12.7 × 6 mm		Ø25.4 × 6 mm	
	@ 1064	@ 532	@ 355	Catalogue number	Price, EUR	Catalogue number	Price, EUR
0.5	0.22	0.23	0.24	311-1100E	50	311-1200E	60
1	0.45	0.46	0.48	311-1101E	50	311-1201E	60
2	0.90	0.92	0.95	311-1102E	50	311-1202E	60
3	1.35	1.38	1.43	311-1103E	50	311-1203E	60
5	2.26	2.31	2.39	311-1105E	50	311-1205E	60

LASER DISPERSING PRISMS

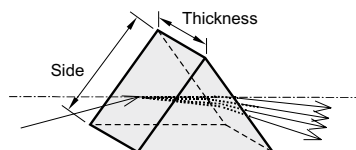
FEATURES

- › Separate light by wavelength
- › Are made so that entrance and exit beams pass through at the Brewster angle

Like Brewster angle windows, laser dispersing prisms can be used inside the cavity of a laser operating on very low gain laser transitions, where even slight reflection losses may be intolerable.

Contact us for other types of prisms e.g. trapezoidal, various isosceles, Dove, Amici, Penta, etc.

Custom fabrication also available: coating, cutting, edging, drilling according to your specification.



SPECIFICATIONS

Material	BK7, UV FS, SF11
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Surface flatness	$\lambda/4$ @ 633 nm
Apex angle tolerance	± 2 arcmin
Design wavelength	800 nm



Most of the Prisms are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com

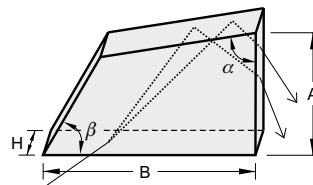


Material	Maximum input beam diameter, mm	Side length, mm	Thickness, mm	Apex angle	Catalogue number	Price, EUR
BK7	6.0	15	10	67°	320-0110	40
UV FS	6.0	15	10	69°	320-1110	72
SF11	6.0	15	10	59°	320-8110	49
BK7	12.0	25	18	67°	320-0218	69
UV FS	12.0	25	18	69°	320-1218	125
SF11	12.0	25	18	59°	320-8218	95
BK7	22.0	50	25	67°	320-0525	140
UV FS	22.0	50	25	69°	320-1525	260
SF11	22.0	50	25	59°	320-8525	195

PELLIN-BROCA PRISMS

FEATURES

- › Extremely small loss of a p-polarized beam
- › Light separated by wavelength is conveniently turned at an 90° angle with minimum deviation
- › UV FS prisms provide 1.26° separation between 532 nm and 1064 nm



In a Pellin-Broca prism, an ordinary dispersing prism is split in half along the bisector of the apex angle. Using a right angle prism, the two halves are joined to create a dispersing prism with an internal right angle bend obtained by total internal reflection. The entrance beam is deviated at an 90° angle to its initial direction.

SPECIFICATIONS

Material	BK7, UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Surface flatness	$\lambda/10$ @ 633 nm
Angles	$\alpha = 79.5^\circ \pm 0.5^\circ$, $\beta = 60^\circ \pm 1^\circ$
Design wavelength	546.1 nm
Dimensions	± 0.2 mm
Clear aperture	> 80% of dimensions

HOUSING ACCESSORIES

Tilt/Rotation Stage
860-0110

Find more at EksmaOptics.com



Material	A, mm	B, mm	H, mm	Catalogue number	Price, EUR
BK7	11.0	20.0	6.4	325-0206	57
	23.5	40.0	12.7	325-0412	63
UV FS	11.0	20.0	6.4	325-1206	110
	15.0	26.0	15.0	325-1215	121
	23.5	40.0	12.7	325-1412	150

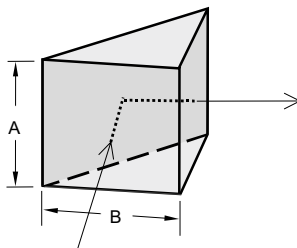
RIGHT ANGLE PRISMS

FEATURES

- › 45–45–90 degree prisms
- › Can be used as internal or external reflectors or as retro-reflectors

These prisms are used to direct beams at 90 degrees by using a hypotenuse face in total internal reflection (TIR). Right angle prisms are often preferable to an inclined mirror in applications involving severe acoustic or inertial loads, because they are easier to mount and deform much less than a mirror in response to external mechanical stress. As long as acceptance angle limitations for TIR from the roof faces are not exceeded, right angle prisms can serve as a retro reflector, turning beams back to the original direction.

For various HR or AR coatings, please refer to the Coatings section.



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Surface flatness	$\lambda/4$ @ 633 nm
Clear aperture	80% of the face size
90° angle tolerance	± 2 arcmin or ± 5 arcsec
Pyramidal tolerance	± 1 arcmin or ± 30 arcsec
Dimensions	± 0.25 mm

Size of face, A × B mm	90° angle tolerance	Pyramidal tolerance	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
5.0 × 5.0	2 arcmin	1 arcmin	330-0052	18	330-1052	45
10.0 × 10.0	2 arcmin	1 arcmin	330-0102	20	330-1102	49
12.5 × 12.5	2 arcmin	1 arcmin	330-0122	22	330-1122	51
15.0 × 15.0	2 arcmin	1 arcmin	330-0152	25	330-1152	55
20.0 × 20.0	2 arcmin	1 arcmin	330-0202	31	330-1202	59
25.0 × 25.0	2 arcmin	1 arcmin	330-0252	37	330-1252	70
10.0 × 10.0	5 arcsec	30 arcsec	330-0105	42	330-1105	93
12.5 × 12.5	5 arcsec	30 arcsec	330-0125	44	330-1125	95
15.0 × 15.0	5 arcsec	30 arcsec	330-0155	50	330-1155	103
20.0 × 20.0	5 arcsec	30 arcsec	330-0205	57	330-1205	116
25.0 × 25.0	5 arcsec	30 arcsec	330-0255	73	330-1255	142

Custom fabrication also available: coating, cutting, edging, drilling according to your specification.

HOUSING ACCESSORIES

Prism Holders
840-0160, 840-0170

Find more at
EksmaOptics.com



Contact us for other types of prisms
e.g. trapezoidal, various isosceles, Dove, Amici, Penta, etc.

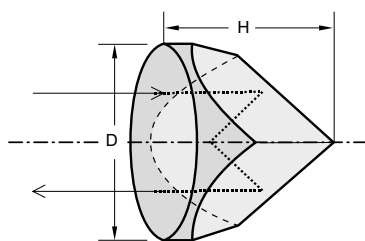
CORNER CUBES

FEATURES

- Incident light deviates by 180 degrees independently of the angle of incidence

These prisms have 3 mirror surfaces making angles of 90° to each other, juxtaposed to form the corner of a cube with the entrance face perpendicular to the cube diagonal. Respective of an incident direction, all beams are reflected back to the original direction. Solid corner cubes are used in high precision applications or with lasers over very long distances. These "angle insensitive" mirrors therefore find frequent applications in situations where orientation is difficult or impossible to control and where a mirror would therefore be unsatisfactory.

Contact us for other types of prisms e.g. trapezoidal, various isosceles, Dove, Amici, Penta, etc.



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Surface flatness	$\lambda/4$ at 633 nm
Angle tolerances	± 5 arcsec
Beam deviation	$180^\circ \pm 30$ sec
Diameter tolerance	$+0.0 / -0.3$ mm
Clear aperture	>80%
Coating	uncoated

Material	Diameter D, mm	Height H, mm	Catalogue number	Price, EUR
BK7	22.0	17.5	340-0217	120
	25.4	17.5	340-0217M	140
	25.4	19.0	340-0219	135
	38.1	28.5	340-0329	175
	50.8	38.0	340-0538	180
	63.5	48.0	340-0648	250
UV FS	22.0	17.5	340-1217	165
	25.4	17.5	340-1217M	185

Models [340-0217M](#) and [340-1217M](#) are mounted into black anodized aluminium ring Ø25.4 mm and clear aperture Ø17 mm.

MOUNTING SUGGESTION



Most of the Corner Cubes are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



HOUSING ACCESSORIES

Kinematic Mirror and Beamsplitter Mount 840-0020

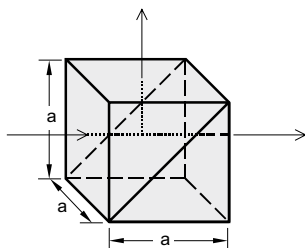
Find more at EksmaOptics.com



NON-POLARIZING BROADBAND CUBE BEAMSPLITTERS

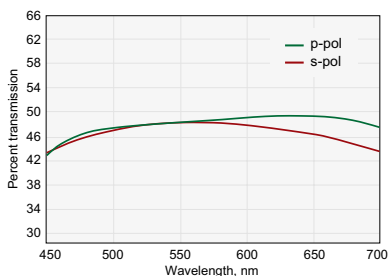
FEATURES

- Cemented for low power applications
- Typical damage threshold:
 $>0.1 \text{ J/cm}^2$, 10 ns, 10 Hz at 1064 nm
- Four sides broadband antireflection coated:
 $R < 1\%$ @ 450–700 nm or $R < 1\%$ @
750–1100 nm



SPECIFICATIONS

Material	BK7
Size tolerance	$\pm 0.25 \text{ mm}$
Surface quality	40 – 20 scratch & dig
Surface flatness	$\lambda/4$ at 633 nm
Beam deviation	$< 5 \text{ arcmin}$
Clear aperture	$> 80\%$ of size
Absorption	$< 10\%$
Reflection/Transmission ratio	50/50 $\pm 5\%$
Transmission	$T_p = T_s = 45 \pm 5\%$



Typical transmission curve @ 450–700 nm

Operating wavelength, nm	Size, mm	Unmounted		Mounted	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
450–700	10 × 10	351-0107	135	351-0107-M2Ps	185
450–700	15 × 15	351-0157	150	351-0157-M2Ps	205
450–700	20 × 20	351-0207	155	351-0207-M2P	225
450–700	25 × 25	351-0257	170	351-0257-M2P	245
750–1100	10 × 10	351-0108	135	351-0108-M2Ps	185
750–1100	15 × 15	351-0158	150	351-0158-M2Ps	205
750–1100	20 × 20	351-0208	155	351-0208-M2P	225
750–1100	25 × 25	351-0258	170	351-0258-M2P	245

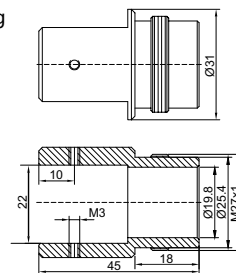
MOUNTING SUGGESTION

Adjustable Polarizer Holder of Side Driver 840-0195



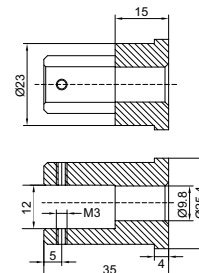
MOUNTING

Example of **M2P** mount for Cube Polarizing Beamsplitters of 20×20 mm standard dimensions.



M2P mount can be used with 840-0180, 840-0195, 840-0020.

Example of **M2Ps** mount for Cube Polarizing Beamsplitters of 10×10 mm dimensions.



M2Ps mount can be used with 840-0180, 840-0020.

Drawings of M2P and M2Ps for prisms of other dimensions are available on request.

Polarizing Optics

COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

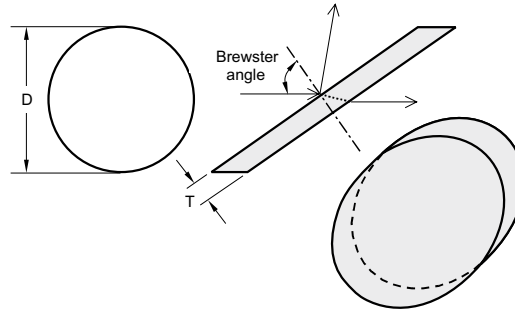
BREWSTER WINDOWS

FEATURES

- Transmit 100% p-polarization components
- Reflect 20% s-polarization components

Brewster windows are intended for high energy laser beams intra cavity usage.

Please contact us for other Brewster windows size or precision requirements.



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	90% of diameter
Parallelism	< 10 arcsec
Axis tolerance	+0.00 / -0.12 mm
Thickness tolerance	± 0.2 mm

Minor axis D, mm	Thickness T, mm	BK7		UV FS	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
8.0	2.0	410-0082	55	410-1082	70
12.5	3.0	410-0123	65	410-1123	87
25.0	5.0	410-0255	75	410-1255	145
40.0	8.0	410-0408	99	410-1408	195
50.0	8.0	410-0508	130	410-1508	250

THIN FILM LASER POLARIZERS (56° Angle of Incidence)

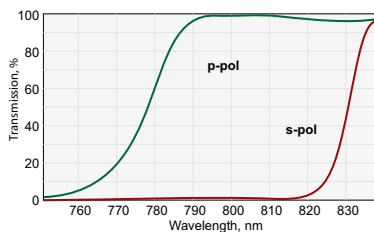
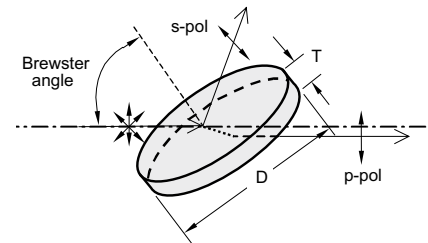
FEATURES

- Provide the achievement of strictly linear polarization of laser radiation
- Utilise the polarization which occurs on reflection from a plane surface

Thin Film Polarizers are designed for use in the most demanding lasers. Due to a high laser damage threshold reaching 10 J/cm^2 @ 1064 nm 8 ns, they are used as an alternative to Glan laser polarizing prisms or cube polarizing beamsplitters.

Typical applications are intracavity Q-switch hold-off polarizers or extracavity attenuators for Nd:YAG lasers.

Thin Film Polarizers can be used at an $> 40^\circ$ angle of incidence, but polarization is most efficient and appears in a broad wavelength range at 56° AOI (Brewster angle). Typical polarization ratio T_p/T_s is 200:1. Standard size is up to $\varnothing 50 \text{ mm}$ (2"), while max. available dimensions are $100 \times 200 \text{ mm}$. For optimal transmission a Thin Film Polarizer should be mounted in an appropriate holder for angular adjustment.



420-0126.

Transmission @ 800 nm, $T_s/T_p > 99.5/95.0 \%$

SPECIFICATIONS

Material	BK7, UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	<30 arcsec
Clear aperture	>90%
Angle of incidence (AOI)	$56 \pm 2^\circ$
Diameter tolerance	+0.0 / -0.12 mm
Thickness tolerance	± 0.2 mm
Transmission efficiency	$T_p > 95\%$
Extinction ratio T_p/T_s	>200:1
Laser damage threshold	10 J/cm^2 10 nsec pulse at 1064 nm typical

BK7 ROUND THIN FILM POLARIZERS

Rs / Tp > 99.5 / 95.0%. Extinction ratio for transmitted light Tp/Ts >200:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
515	12.7	3.0	420-0114E	108
532	12.7	3.0	420-0124E	108
633	12.7	3.0	420-0125E	108
775	12.7	3.0	420-0127E	108
800	12.7	3.0	420-0126E	108
780 – 820	12.7	3.0	420-0136E	160
1030	12.7	3.0	420-0118E	115
1010 – 1050	12.7	3.0	420-0138E	160
1064	12.7	3.0	420-0128E	115
515	25.4	3.0	420-0244E	128
532	25.4	3.0	420-0254E	128
633	25.4	3.0	420-0255E	128
775	25.4	3.0	420-0257E	128
800	25.4	3.0	420-0256E	128
780 – 820	25.4	3.0	420-0266E	189
1030	25.4	3.0	420-0248E	155
1010 – 1050	25.4	3.0	420-0268E	189
1064	25.4	3.0	420-0258E	155
515	50.8	6.0	420-0514E	206
532	50.8	6.0	420-0504E	206
633	50.8	6.0	420-0505E	206
775	50.8	6.0	420-0507E	215
800	50.8	6.0	420-0506E	305
780 – 820	50.8	6.0	420-0526E	309
1030	50.8	6.0	420-0518E	255
1010 – 1050	50.8	6.0	420-0528E	335
1064	50.8	6.0	420-0508E	255

BK7 RECTANGULAR THIN FILM LASER POLARIZERS

Rs / Tp > 99.5 / 95.0%. Extinction ratio for transmitted light Tp/Ts >200:1

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
515	28.6	14.3	3.0	420-0274	142
532	28.6	14.3	3.0	420-0284	142
633	28.6	14.3	3.0	420-0285	142
775	28.6	14.3	3.0	420-0287	142
800	28.6	14.3	3.0	420-0286	142
780-820	28.6	14.3	3.0	420-0296	220
1030	28.6	14.3	3.0	420-0278	170
1010-1050	28.6	14.3	3.0	420-0298	220
1064	28.6	14.3	3.0	420-0288	170

HOUSING ACCESSORIES

Adapters for
Polarizer at 56°
840-0117, 840-0118

Find more at [EksmaOptics.com](#)



Variable Attenuators for
Linearly Polarized Laser
Beam 990-0070, -0071

See page 5.14



UV FS ROUND THIN FILM LASER POLARIZERS

Rs / Tp > 99.5 / 95.0%. Extinction ratio for transmitted light Tp/Ts >200:1

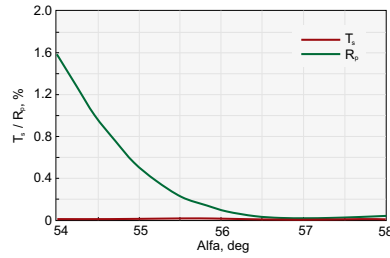
Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
266	12.7	3.0	420-1110E	180
343	12.7	3.0	420-1112E	164
355	12.7	3.0	420-1122E	164
400	12.7	3.0	420-1123E	131
515	12.7	3.0	420-1114E	131
532	12.7	3.0	420-1124E	131
800	12.7	3.0	420-1126E	131
780 – 820	12.7	3.0	420-1136E	196
1030	12.7	3.0	420-1118E	145
1010 – 1050	12.7	3.0	420-1138E	196
1064	12.7	3.0	420-1128E	145
266	25.4	3.0	420-1240E	200
343	25.4	3.0	420-1242E	182
355	25.4	3.0	420-1252E	182
400	25.4	3.0	420-1253E	154
515	25.4	3.0	420-1244E	154
532	25.4	3.0	420-1254E	154
800	25.4	3.0	420-1256E	154
780 – 820	25.4	3.0	420-1266E	231
1030	25.4	3.0	420-1248E	180
1010 – 1050	25.4	3.0	420-1268E	231
1064	25.4	3.0	420-1258E	180
266	50.8	6.0	420-1510E	358
343	50.8	6.0	420-1512E	325
355	50.8	6.0	420-1502E	325
400	50.8	6.0	420-1503E	295
515	50.8	6.0	420-1514E	295
532	50.8	6.0	420-1504E	295
800	50.8	6.0	420-1506E	305
780 – 820	50.8	6.0	420-1526E	404
1030	50.8	6.0	420-1518E	315
1010 – 1050	50.8	6.0	420-1528E	404
1064	50.8	6.0	420-1508E	315

UV FS RECTANGULAR THIN FILM LASER POLARIZERS

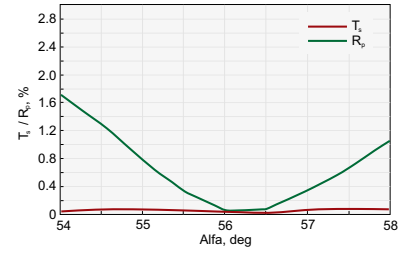
Rs / Tp > 99.5 / 95.0%. Extinction ratio for transmitted light Tp/Ts >200:1

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
266	28.6	14.3	3.0	420-1270	280
343	28.6	14.3	3.0	420-1272	255
355	28.6	14.3	3.0	420-1282	255
400	28.6	14.3	3.0	420-1283	215
515	28.6	14.3	3.0	420-1274	215
532	28.6	14.3	3.0	420-1284	215
800	28.6	14.3	3.0	420-1286	215
780 – 820	28.6	14.3	3.0	420-1296	315
1030	28.6	14.3	3.0	420-1278	225
1010 – 1050	28.6	14.3	3.0	420-1298	315
1064	28.6	14.3	3.0	420-1288	225
266	35.0	20.0	3.0	420-1370	322
343	35.0	20.0	3.0	420-1372	293
355	35.0	20.0	3.0	420-1382	293
400	35.0	20.0	3.0	420-1383	247
515	35.0	20.0	3.0	420-1374	247
532	35.0	20.0	3.0	420-1384	247
800	35.0	20.0	3.0	420-1386	247
780 – 820	35.0	20.0	3.0	420-1396	362
1030	35.0	20.0	3.0	420-1378	259
1010 – 1050	35.0	20.0	3.0	420-1398	362
1064	35.0	20.0	3.0	420-1388	259

ULTRA HIGH TRANSMISSION THIN FILM POLARIZERS



420-1254UHT.
Ultra High Transmission @ 532 nm,
 $T_s < 0.2\%$, $R_p < 0.2\%$, $AOI = 56^\circ$

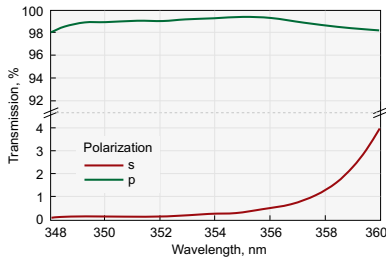


420-1258UHT.
Ultra High Transmission @ 1064 nm,
 $T_s < 0.2\%$, $R_p < 0.2\%$, $AOI = 56^\circ$

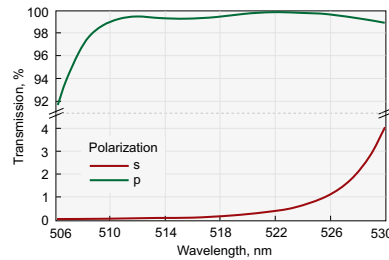
ROUND POLARIZERS. Material – UV FS. $T_s < 0.2\%$, $R_p < 0.2\%$. Extinction ratio for transmitted light $T_p/T_s > 500:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
532	25.4	3	420-1254UHT	260
800	25.4	3	420-1256UHT	260
1030	25.4	3	420-1248UHT	304
1064	25.4	3	420-1258UHT	304

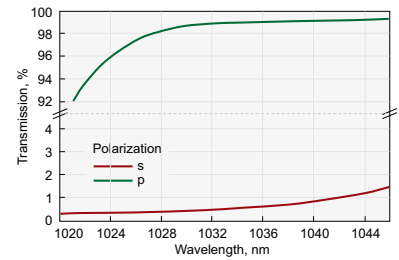
HIGH TRANSMISSION THIN FILM POLARIZERS



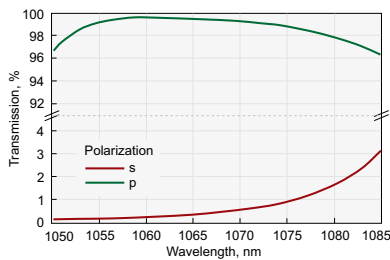
420-1252HT.
High Transmission @ 355 nm, $R_s/T_p > 99.5/99.0\%$



420-1244HT.
High Transmission @ 515 nm, $R_s/T_p > 99.5/99.0\%$



420-1248HT.
High Transmission @ 1030 nm, $R_s/T_p > 99.5/99.0\%$



420-1258HT.
High Transmission @ 1064 nm, $R_s/T_p > 99.5/99.0\%$

ROUND POLARIZERS. Material – UV FS. $R_s / T_p > 99.5 / 99.0\%$. Extinction ratio for transmitted light $T_p/T_s > 200:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3	420-1242HT	237
355	25.4	3	420-1252HT	237
515	25.4	3	420-1244HT	200
532	25.4	3	420-1254HT	200
800	25.4	3	420-1256HT	200
1030	25.4	3	420-1248HT	234
1064	25.4	3	420-1258HT	234

RECTANGULAR POLARIZERS

Material – UV FS. $R_s / T_p > 99.5 / 99.0\%$. Extinction ratio for transmitted light $T_p/T_s > 200:1$

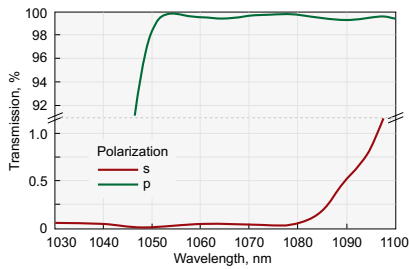
Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
1030	28.6	14.3	3	420-1278HT	270
1064	28.6	14.3	3	420-1288HT	270

RELATED PRODUCTS

Glan Laser Polarizing Prisms
See page 1.63

Wollaston Prisms
See page 1.65

THIN FILM POLARIZERS WITH HIGH EXTINCTION RATIO



420-1258HE.
 $T_p > 98\%$, $T_s < 0.1\%$

ROUND POLARIZERS. Material – UV FS. $R_s / T_p > 99.5 / 99.0\%$. Extinction ratio for transmitted light $T_p/T_s > 200:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3	420-1242HE	218
355	25.4	3	420-1252HE	218
515	25.4	3	420-1244HE	185
532	25.4	3	420-1254HE	185
780 – 820	25.4	3	420-1266HE	275
800	25.4	3	420-1256HE	185
1030	25.4	3	420-1248HE	216
1064	25.4	3	420-1258HE	216

RECTANGULAR POLARIZERS

Material – UV FS. $R_s / T_p > 99.5 / 99.0\%$. Extinction ratio for transmitted light $T_p/T_s > 200:1$

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
532	20	15	6	420-1484HE	155
532	30	20	6	420-1584HE	210
1030	20	15	6	420-1478HE	165
1030	30	20	6	420-1578HE	220
1064	20	15	6	420-1488HE	165
1064	30	20	6	420-1588HE	220

HOUSING ACCESSORIES

Adapters for
Polarizer at 56°
840-0117, 840-0118
[Find more at EksmaOptics.com](#)

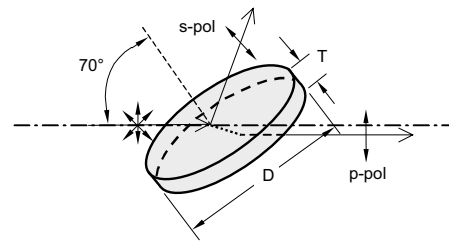


Variable Attenuators for
Linearly Polarized Laser
Beam 990-0070, -0071
[See page 5.14](#)



THIN FILM POLARIZERS (70° Angle of Incidence)

Broadband thin film polarizers separate the s- and p-polarization components in broad region at 70° angle of incidence (AOI). These polarizers are designed to be used in high energy laser systems, typically as extracavity attenuators for femtosecond lasers. Polarizers are made from UV fused silica and feature a high laser damage threshold – up to 50 mJ/cm².



SPECIFICATIONS

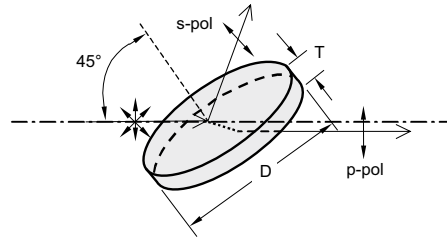
Substrate material	UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	>90% of diameter
Angle of incidence (AOI)	$70 \pm 2^\circ$
Parallelism	<30 arcsec

RECTANGULAR POLARIZERS. Material – UV FS. $R_s / T_p > 99.5 / 95.0\%$. Extinction ratio for transmitted light $T_p/T_s > 200:1$

Operating wavelength region, nm	Centre wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
		Length, mm	Width, mm			
750 – 850	800	60.0	20.0	4.0	420-1696BBi70	435
980 – 1080	1030	60.0	20.0	4.0	420-1698BBi70	435

THIN FILM POLARIZERS (45° Angle of Incidence)

These thin film polarizers separate or combine the s- and p-polarization components at 45° angle of incidence. They are designed for use in high energy lasers. Polarizers are made from UV FS and feature high laser damage threshold reaching 10 J/cm² at 1064 nm.



SPECIFICATIONS

Substrate material	UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Clear aperture	>90% of diameter
Angle of incidence (AOI)	45 ± 2°
Parallelism	<30 arcsec

THIN FILM POLARIZERS WITH HIGH EXTINCTION RATIO

ROUND POLARIZERS.

Material – UV FS. Tp > 98%, Ts < 0.1%; Extinction ratio for transmitted light Tp/Ts: >1000:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3.0	420-1242i45HE	328
355	25.4	3.0	420-1252i45HE	328
515	25.4	3.0	420-1244i45HE	295
532	25.4	3.0	420-1254i45HE	295
1030	25.4	3.0	420-1248i45HE	315
1053	25.4	3.0	420-1238i45HE	315
1064	25.4	3.0	420-1258i45HE	315
343	50.8	6.0	420-1512i45HE	640
355	50.8	6.0	420-1502i45HE	640
515	50.8	6.0	420-1514i45HE	555
532	50.8	6.0	420-1504i45HE	555
1030	50.8	6.0	420-1518i45HE	620
1053	50.8	6.0	420-1538i45HE	620
1064	50.8	6.0	420-1508i45HE	620

STANDARD THIN FILM POLARIZERS

ROUND POLARIZERS.

Material – UV FS. Rs / Tp > 99.5 / 95.0%. Extinction ratio for transmitted light Tp/Ts >200:1

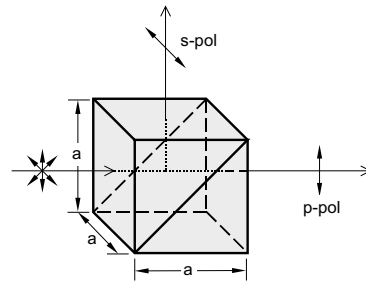
Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3.0	420-1242i45	238
355	25.4	3.0	420-1252i45	238
515	25.4	3.0	420-1244i45	200
532	25.4	3.0	420-1254i45	200
1030	25.4	3.0	420-1248i45	225
1053	25.4	3.0	420-1238i45	225
1064	25.4	3.0	420-1258i45	225
343	50.8	6.0	420-1512i45	455
355	50.8	6.0	420-1502i45	455
515	50.8	6.0	420-1514i45	395
532	50.8	6.0	420-1504i45	395
1030	50.8	6.0	420-1518i45	440
1053	50.8	6.0	420-1538i45	440
1064	50.8	6.0	420-1508i45	440

CUBE POLARIZING BEAMSPLITTERS

FEATURES

- Durable and convenient
- Optimised for popular laser wavelengths

Polarizing film is coated on the internal face of a cube beamsplitter. Thin film polarizers utilize the polarization which occurs on reflection deviated by 90° angle. Cube polarizing beamsplitters can be optimized for a particular wavelength to give superior performance for laser application can be optimised for a particular wavelength to give superior performance for laser applications.

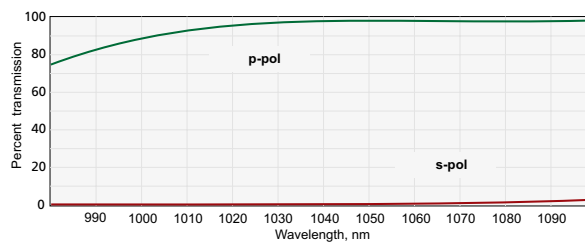


SPECIFICATIONS

Material	BK7, UV FS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Surface flatness	$\lambda/4$ @ 633 nm
Clear aperture	90% of the face size
Beam deviation	<3 arcmin
Dimension tolerance	± 0.3 mm
Laser damage threshold	0.3 J/cm ² 10 ns pulses at 1064 nm

Please contact us for polarizing cubes
with an extinction ratio of up to $T_p/T_s > 500:1$

The four outer faces are all anti-reflection coated.



Typical transmission curve @ 1064 nm

BK7 GLASS, $T_p/T_s > 200:1$

Wavelength range, nm	Reflection s-pol, %	Transmission p-pol, %	Side axa, mm	Unmounted		Mounted	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
532	$R_s > 99.5$	$T_p > 95$	10 × 10	430-0101	135	430-0101-M2Ps	185
532	$R_s > 99.5$	$T_p > 95$	15 × 15	430-0151	165	430-0151-M2P	215
532	$R_s > 99.5$	$T_p > 95$	20 × 20	430-0201	185	430-0201-M2P	235
532	$R_s > 99.5$	$T_p > 95$	25 × 25	430-0251	215	430-0251-M2P	265
633	$R_s > 99.5$	$T_p > 95$	10 × 10	430-0104	135	430-0104-M2Ps	185
633	$R_s > 99.5$	$T_p > 95$	15 × 15	430-0154	165	430-0154-M2P	215
633	$R_s > 99.5$	$T_p > 95$	20 × 20	430-0204	185	430-0204-M2P	235
633	$R_s > 99.5$	$T_p > 95$	25 × 25	430-0254	215	430-0254-M2P	265
780	$R_s > 99.5$	$T_p > 95$	10 × 10	430-0102	135	430-0102-M2Ps	185
780	$R_s > 99.5$	$T_p > 95$	15 × 15	430-0152	165	430-0152-M2P	215
780	$R_s > 99.5$	$T_p > 95$	20 × 20	430-0202	185	430-0202-M2P	235
780	$R_s > 99.5$	$T_p > 95$	25 × 25	430-0252	215	430-0252-M2P	265
1064	$R_s > 99.5$	$T_p > 95$	10 × 10	430-0103	135	430-0103-M2Ps	185
1064	$R_s > 99.5$	$T_p > 95$	15 × 15	430-0153	165	430-0153-M2P	215
1064	$R_s > 99.5$	$T_p > 95$	20 × 20	430-0203	185	430-0203-M2P	235
1064	$R_s > 99.5$	$T_p > 95$	25 × 25	430-0253	215	430-0253-M2P	265

UV FS, $T_p/T_s > 100:1$

Wavelength range, nm	Reflection s-pol, %	Transmission p-pol, %	Side axa, mm	Unmounted		Mounted	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
280	$R_s > 99$	$T_p > 90$	10 × 10	430-1103	290	430-1103-M2Ps	340
280	$R_s > 99$	$T_p > 90$	15 × 15	430-1153	350	430-1153-M2P	400
280	$R_s > 99$	$T_p > 90$	20 × 20	430-1203	390	430-1203-M2P	440
308	$R_s > 99$	$T_p > 90$	10 × 10	430-1105	280	430-1105-M2Ps	330
308	$R_s > 99$	$T_p > 90$	15 × 15	430-1155	340	430-1155-M2P	390
308	$R_s > 99$	$T_p > 90$	20 × 20	430-1205	380	430-1205-M2P	430
355	$R_s > 99$	$T_p > 90$	10 × 10	430-1107	270	430-1107-M2Ps	320
355	$R_s > 99$	$T_p > 90$	15 × 15	430-1157	330	430-1157-M2P	380
355	$R_s > 99$	$T_p > 90$	20 × 20	430-1207	380	430-1207-M2P	430

Please contact us if you need polarizing beamsplitters of other wavelengths, other sizes or other configurations.

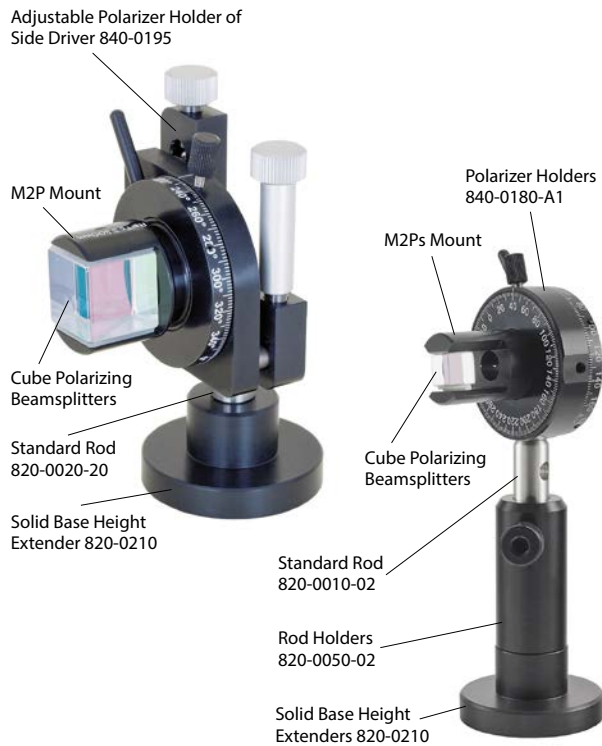
HOUSING
ACCESSORIES

for unmounted cube
polarizing beamsplitters

Prism Holders
840-0160,
840-0170

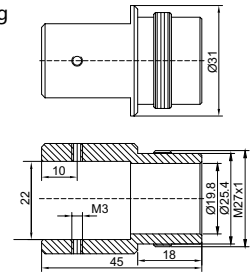
Find more at
EksmaOptics.com

MOUNTING SUGGESTION



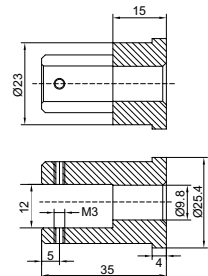
MOUNTING

Example of **M2P** mount for Cube Polarizing Beamsplitters of 20×20 mm standard dimensions.



M2P mount can be used with 840-0180, 840-0195, 840-0020.

Example of **M2Ps** mount for Cube Polarizing Beamsplitters of 10×10 mm dimensions.



M2Ps mount can be used with 840-0180, 840-0020.

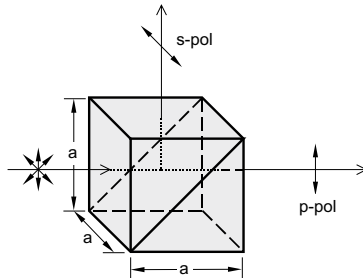
Drawings of M2P and M2Ps for prisms of other dimensions are available on request.

HIGH ENERGY POLARIZING CUBE BEAMSPLITTERS

FEATURES

- Optically contacted for high power applications
- Typical damage threshold:
>15 J/cm², 10 ns, 10 Hz at 1064 nm
- Precision surface quality
- High extinction ratio

The four outer faces are all anti-reflection coated.



SPECIFICATIONS

Material	UVFS
Size	12.7×12.7×12.7 mm
Size tolerance	±0.2mm
Extinction ratio	>1:500
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	λ/10 at 633 nm
Beam deviation	<3 arcmin
Clear aperture	>85% of size
Reflection s-polarization	>99.5%
Transmission p-polarization	>97% for laser line >90% for broadband

HOUSING ACCESSORIES

for unmounted cube polarizing beamsplitters

Prism Holders
840-0160, 840-0170

Find more at
EksmaOptics.com

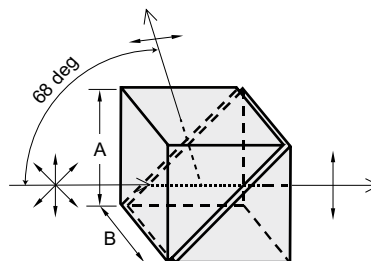


Operating wavelength, nm	Laser Damage threshold, 10 ns, 10 Hz	Unmounted		Mounted	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
355	>3 J/cm ² at 355 nm	435-1127	375	435-1127-M2Ps	425
532	>6 J/cm ² at 532 nm	435-1121	350	435-1121-M2Ps	400
800	>8 J/cm ² at 800 nm	435-1122	350	435-1122-M2Ps	400
1064	>15 J/cm ² at 1064 nm	435-1123	350	435-1123-M2Ps	400
420 – 680	>1 J/cm ² at 532 nm	436-1121	375	436-1121-M2Ps	425
700 – 1080	>2 J/cm ² at 1064 nm	436-1123	375	436-1123-M2Ps	425

GLAN LASER POLARIZING PRISMS

FEATURES

- Transmit a linearly polarized extraordinary beam without deviation from its initial direction
- Reflect an ordinary ray out of the prism into either the black glass or the escape port
- Air-spaced prisms
- Available with two, one or no escape ports in mounts for extra power capacity



Glan laser polarizers are manufactured from the finest optical grade natural calcite or α -BBO. They are useful in applications requiring a high degree of polarization purity, high total transmission and low, medium or high power requirements.

We also provide Glan Thompson, Beamsplitting Thompson prisms, Beam Displacers, Laser Polarizing Beamsplitters, etc.

Please contact us for more information.

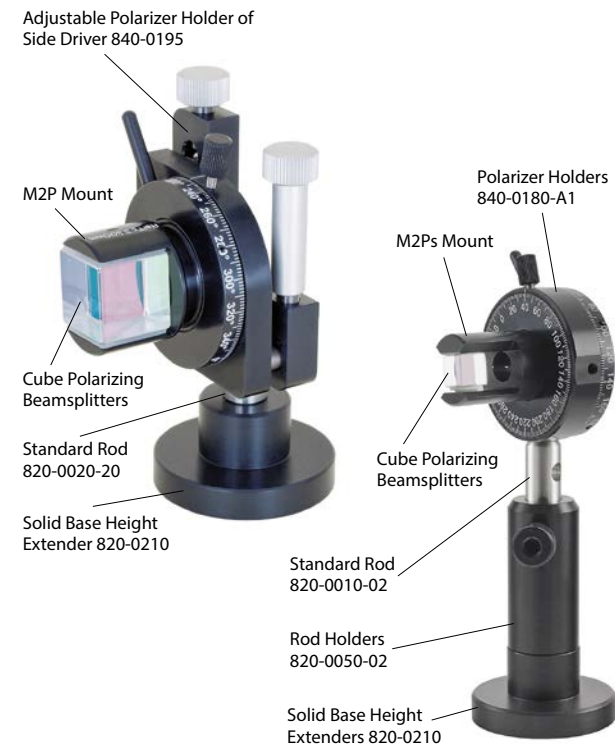
NATURAL CALCITE GLAN LASER PRISMS

SPECIFICATIONS

Material	Natural calcite
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/4$ at 633 nm
Beam deviation	<3 arcmin
Wavelength range	350 – 2100 nm
Extinction ratio	1:10-5
Laser damage threshold	>5 J/cm ² , 10 ns pulses, 1064 nm

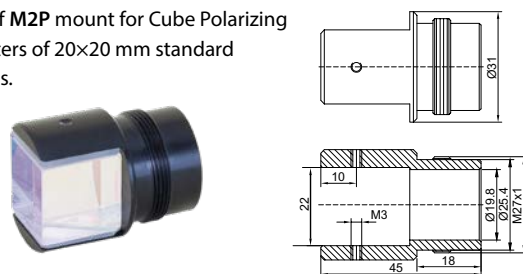
Standard dimensions A × B, mm	Unmounted		Mounted	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
10 × 10	440-2010	475	440-2010-M2Ps	525
12 × 12	440-2012	575	440-2012-M2Ps	625
14 × 14	440-2014	790	440-2014-M2Ps	840
20 × 20	440-2020	1900	440-2020-M2P	1950

MOUNTING SUGGESTION



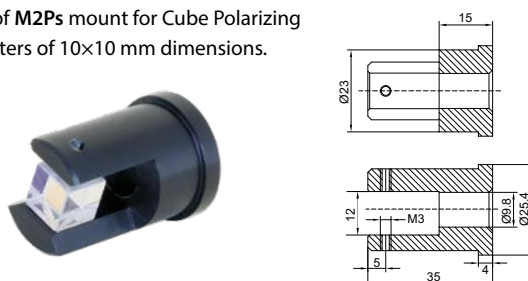
MOUNTING

Example of M2P mount for Cube Polarizing Beamsplitters of 20×20 mm standard dimensions.



M2P mount can be used with 840-0180, 840-0195, 840-0020.

Example of M2Ps mount for Cube Polarizing Beamsplitters of 10×10 mm dimensions.



M2Ps mount can be used with 840-0180, 840-0020.

Drawings of M2P and M2Ps for prisms of other dimensions are available on request.

α-BBO GLAN LASER PRISMS

SPECIFICATIONS

Material	α-BBO
Transmittance wavelength range	200–3500 nm
Extinction ratio	1 : 10 ⁻⁵
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	λ/4 at 633 nm
Beam deviation	<3 arcmin
Angular field	>6 deg
Coating	Single layer MgF ₂
Mount	Black anodized aluminium

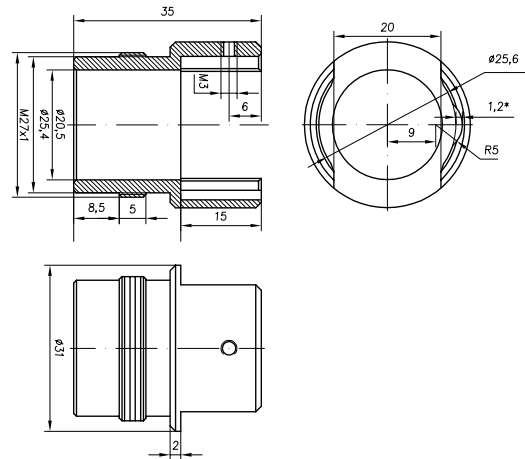
Operating wavelength range, nm	Clear aperture CA, mm	Outer mount OD, mm	Mounted, without adapter		Mounted, with adapter	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
200–270	Ø8	Ø25.4	441-2108	510	441-2108-M2Pd	560
200–270	Ø10	Ø25.4	441-2110	595	441-2110-M2Pd	645
200–270	Ø15	Ø30	441-2115	845	441-2115-M2Pd	895
260–300	Ø8	Ø25.4	441-2208	490	441-2208-M2Pd	540
260–300	Ø10	Ø25.4	441-2210	580	441-2210-M2Pd	630
260–300	Ø15	Ø30	441-2215	830	441-2215-M2Pd	880
300–400	Ø8	Ø25.4	441-2308	490	441-2308-M2Pd	540
300–400	Ø10	Ø25.4	441-2310	580	441-2310-M2Pd	630
300–400	Ø15	Ø30	441-2315	830	441-2315-M2Pd	880

MOUNTING SUGGESTION



MOUNTING

Example of **M2Pd** mount with adapter for α-BBO Glan Laser Prisms with outer diameter mount of 25.4 mm.



Polarizer Holders **840-0180-A1** for prisms with outer diameter of 25.4 mm and **840-0180-A2** for prisms with outer diameter of 30 mm.

HOUSING ACCESSORIES

Polarizer Holders
840-0180

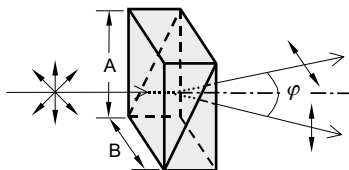
Find more at EksmaOptics.com



WOLLASTON PRISMS

FEATURES

- › Split a beam into two orthogonally polarized divergent beams
- › Made from the finest optical grade natural calcite



SPECIFICATIONS

Material	Natural calcite
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Wavelength range	300–2200 nm
Extinction ratio	1:10 ⁻⁵
Separation angle	10 or 20 deg
Dimension tolerance	±0.25 mm

Wollaston prism polarizers consist of two equal calcite prisms. Both output beams are almost equally deviated. Angular separation of output beams depends on wavelength. The use of highest grade calcite provides useful transmission covering the 300–2200 nm range.

Prisms mounted in black aluminium mounts M2P or M2Ps are available.

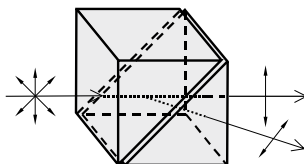
For mount's drawing and mounting suggestion, see page 1.63.

Standard dimensions A × B, mm	Beam separation φ, deg	Unmounted		Mounted	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
10 × 10	10	450-2101	428	450-2101-M2Ps	478
12 × 12	10	450-2121	517	450-2121-M2Ps	567
14 × 14	10	450-2141	545	450-2141-M2P	595
10 × 10	20	450-2102	468	450-2102-M2Ps	518
12 × 12	20	450-2122	555	450-2122-M2Ps	605
14 × 14	20	450-2142	582	450-2142-M2P	632

Other sizes, better quality, different spectral ranges or AR coatings are available on request.

ROCHON POLARIZING PRISMS

Rochon polarizer is made of two α-BBO prisms cemented together. The first prism, cut parallel to the optic axis, receives the light; the second, with the optic axis at right angles, transmits the ordinary ray without deviation but the extraordinary ray is deflected. A Rochon prism can be used to produce plane-polarized light and it can also be used with ultraviolet light. Any separation angle can be designed for specific wavelength upon request.



SPECIFICATIONS

Material	α-BBO
Wavelength range	200–3500 nm
Extinction ratio	1:10 ⁻⁵
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	λ/4 at 633 nm
Beam deviation	<3 arcmin
Separation angle	8–14 deg (8 deg @ 1064nm)
Coating	Single layer MgF ₂
Mount	Black anodized aluminium

Clear aperture Ø, mm	Outer mount Ø, mm	Catalogue number	Price, EUR
8.0	25.4	455-2108	549
10.0	25.4	455-2110	699
15.0	30.0	455-2115	950

RETARDATION PLATES

FEATURES

- › Made from high quality optical grade crystalline quartz
- › Quarter wave and half wave retardation versions available
- › Multiple-order, low-order or zero-order plates
- › Suitable for high and low power laser applications

They rotate the direction of polarization ($\lambda/2$) or convert linear into circular polarization or vice versa ($\lambda/4$).

COATINGS

ZERO ORDER OPTICALLY CONTACTED WAVEPLATES

FEATURES

- › Easily aligned
- › Temperature insensitive
- › Moderately insensitive to wavelength

These are formed from two thin sections which are polished to different thicknesses to have a retardation difference exactly equal to the required. These component plates have orthogonal optic axis directions, so that the roles of the ordinary and extraordinary rays are interchanged in passing from one plate to the other. Retardation error versus wavelength is reduced, therefore they are suitable for fs lasers or laser diode applications.



WINDOWS & FILTERS

MIRRORS

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Nominal thickness of waveplate	1.5–2.5 mm
Wavefront distortion	$\lambda/10$ @ 633 nm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Parallelism	< 10 arcsec
AR coating	R < 0.4%
Laser damage threshold	> 0.5 J/cm ² , 10 nsec pulse, 1064 nm typical

LENSES



Most of the Retardation Plates are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



PRISMS

HOUSING ACCESSORIES

Adjustable Polarizer Holder of Side Drive 840-0195

Find more at EksmaOptics.com



Polarizer Holders 840-0180

Find more at EksmaOptics.com



POLARIZING OPTICS

UV & IR OPTICS

Ø12.7 mm WAVEPLATES. Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1550	460-4201D12	165	460-4401D12	165
1064	460-4205D12	165	460-4405D12	165
1030	460-4208D12	165	460-4408D12	165
852	460-4213D12	165	460-4413D12	165
800	460-4215D12	165	460-4415D12	165
780	460-4220D12	165	460-4420D12	165
633	460-4225D12	165	460-4425D12	165
532	460-4230D12	165	460-4430D12	165
515	460-4232D12	165	460-4432D12	165
488	460-4233D12	165	460-4433D12	165
400	460-4235D12	165	460-4435D12	165
355	460-4240D12	175	460-4440D12	175
343	460-4241D12	175	460-4441D12	175
266	460-4245D12	185	460-4445D12	185
257	460-4246D12	185	460-4446D12	185

Please contact us for other wavelength, size or precision requirements.

Ø20 mm WAVEPLATES. Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1550	460-4201	245	460-4401	245
1064	460-4205	245	460-4405	245
1053	460-4206	245	460-4406	245
1030	460-4208	245	460-4408	245
950	460-4210	245	460-4410	245
852	460-4213	245	460-4413	245
800	460-4215	245	460-4415	245
780	460-4220	245	460-4420	245
770	460-4221	245	460-4421	245
633	460-4225	245	460-4425	245
589	460-4228	245	460-4428	245
532	460-4230	245	460-4430	245
527	460-4231	245	460-4431	245
515	460-4232	245	460-4432	245
488	460-4233	245	460-4433	245
400	460-4235	245	460-4435	245
355	460-4240	270	460-4440	270
343	460-4241	270	460-4441	270
266	460-4245	280	460-4445	280
257	460-4246	280	460-4446	280
244	460-4248	280	460-4448	280

Please contact us for other wavelength, size or precision requirements.

ZERO ORDER AIR-SPACED WAVEPLATES

FEATURES

- › For high power laser application



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	Normal to facet on circumference of retarder
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.2 mm
Wavefront distortion	$\lambda/10$ @ 633 nm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Laser damage threshold	10 J/cm ² , 10 nsec pulse, 1064 nm



Most of the Retardation Plates are available for fast off-the-shelf delivery. Check the availability at www.eksmaoptics.com



HOUSING ACCESSORIES

Polarizer Holders
840-0180

Find more at EksmaOptics.com



Center wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
1064	464-4205	310	464-4405	310
1030	464-4208	310	464-4408	310
800	464-4215	310	464-4415	310
780	464-4220	310	464-4420	310
532	464-4230	310	464-4430	310
515	464-4232	310	464-4432	310
400	464-4235	310	464-4435	310
355	464-4240	335	464-4440	335
343	464-4241	335	464-4441	335
266	464-4245	345	464-4445	345
257	464-4246	345	464-4446	345

ACHROMATIC AIR-SPACED WAVEPLATES



Achromatic waveplates are made from two different materials: crystal quartz and magnesium fluoride with highly efficient broadband antireflection coatings in an air spaced design.

Retardation tolerance of our achromatic waveplates is better than $\lambda/100$ over the entire wavelength range. The flat response of these waveplates is ideal for use with tunable lasers, multiple laser-line systems and other broad spectrum sources.

Our achromatic waveplates are available for four wavelength ranges: VIS (450 – 680 nm), NIR (700 – 1000 nm), 950 – 1300 nm, 1200 – 1650 nm. The waveplates are provided in a black anodized aluminum housing.

SPECIFICATIONS

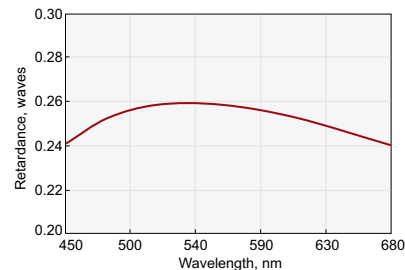
Material	Single crystal quartz and MgF ₂
Clear aperture	Ø12.7 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Ring mount thickness	8.0 ± 0.2 mm
Retardation tolerance	< $\lambda/100$ over wavelength range
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	< $\lambda/8$ @ 632 nm
Parallelism	< 1 arcmin
AR coating	R < 0.8%
Laser damage threshold	> 3 J/cm ² , 10 nsec, 1064 nm typical

Operating wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue nr.	Price, EUR	Catalogue nr.	Price, EUR
450 – 680	467-4205	480	467-4405	480
700 – 1000	467-4210	480	467-4410	480
950 – 1300	467-4215	480	467-4415	480
1200 – 1650	467-4220	480	467-4420	480

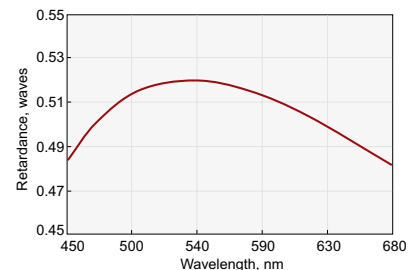
HOUSING ACCESSORIES

High Precision Rotation
Polarizer, Waveplate
Mount 840-0186

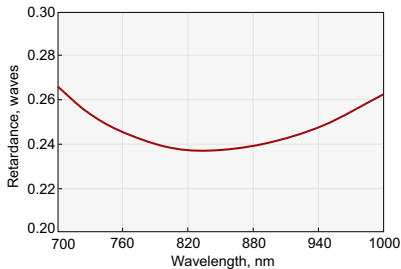
Find more at EksmaOptics.com



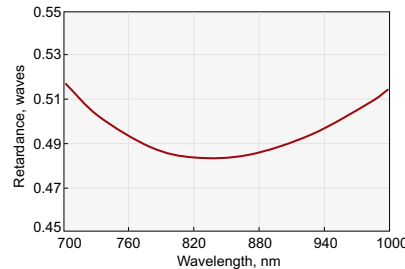
$\lambda/4$ @ 450-680 nm



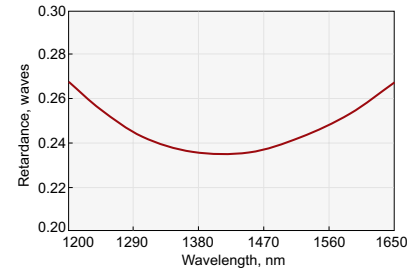
$\lambda/2$ @ 450-680 nm



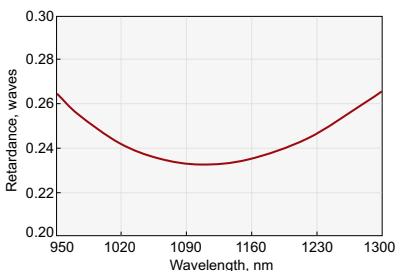
$\lambda/4$ @ 700-1000 nm



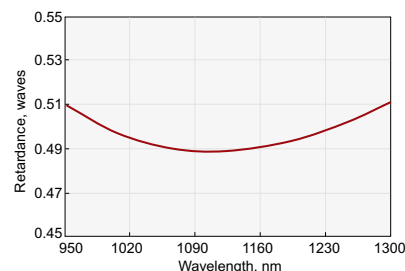
$\lambda/2$ @ 700-1000 nm



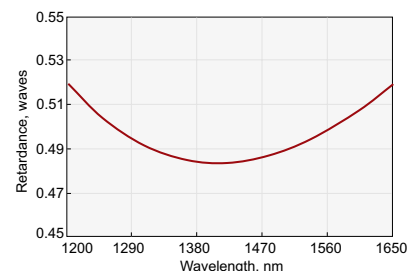
$\lambda/4$ @ 1200-1650 nm



$\lambda/4$ @ 950-1300 nm



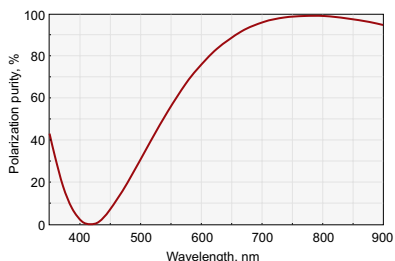
$\lambda/2$ @ 950-1300 nm



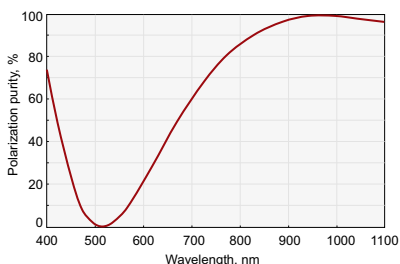
$\lambda/2$ @ 1200-1650 nm

ZERO ORDER DUAL WAVELENGTH WAVEPLATES

When optical axis is turned by 45 degrees to input polarization, the waveplate rotates polarization of Ti:Sapphire laser fundamental (800 nm) by 90 degrees and the polarization of Ti:Sapphire second harmonic (400 nm) remains the same.



Polarization purity of zero order dual waveplate.
 $\lambda/2@800 \text{ nm} + \lambda/400 \text{ nm}$



Polarization purity of zero order dual waveplate.
 $\lambda/2@1030 \text{ nm} + \lambda/515 \text{ nm}$

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10 @ 633 \text{ nm}$
Parallelism	<10 arcsec
AR coating	R<0.5%
Laser damage threshold:	
Optically contacted (465-4211, 465-4212)	>10 mJ/cm ² , 50 fsec pulse, 800 nm typical
Air-spaced (466-4211, 466-4212)	100 mJ/cm ² , 50 fsec pulse, 800 nm typical

Description	AR coated	Catalogue number	Price, EUR
Optically contacted; $\lambda/2@800 \text{ nm} + \lambda@400 \text{ nm}$	800+400 nm	465-4211	345
Optically contacted; $\lambda/2@1030 \text{ nm} + \lambda@515 \text{ nm}$	1030+515 nm	465-4212	345
Air-spaced; $\lambda/2@800 \text{ nm} + \lambda@400 \text{ nm}$	800+400 nm	466-4211	410
Air-spaced; $\lambda/2@1030 \text{ nm} + \lambda@515 \text{ nm}$	1030+515 nm	466-4212	410

HOUSING ACCESSORIES

Polarizer Holders
840-0180

Find more at EksmaOptics.com



LOW ORDER WAVEPLATES

FEATURES

- Thinner than multiple order
- Less than 8 order
- Less temperature and wavelength dependent than multiple order

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Nominal thickness of waveplate	0.15–0.35 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10 @ 633 \text{ nm}$
Parallelism	< 10 arcsec
AR coating	R < 0.4%
Laser damage threshold	10 J/cm ² , 10 nsec pulse, 1064 nm typical

Ø12.7 mm WAVEPLATES. Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1550	461-4201D12	105	461-4401D12	105
1064	461-4205D12	105	461-4405D12	105
1053	461-4206D12	105	461-4406D12	105
1030	461-4208D12	105	461-4408D12	105
800	461-4215D12	105	461-4415D12	105
780	461-4220D12	105	461-4420D12	105
633	461-4225D12	105	461-4425D12	105
532	461-4230D12	105	461-4430D12	105
515	461-4232D12	105	461-4432D12	105
355	461-4240D12	115	461-4440D12	115

Please contact us for other wavelength, size or precision requirements.

Ø20 mm WAVEPLATES. Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1550	461-4201	160	461-4401	160
1064	461-4205	160	461-4405	160
1053	461-4206	160	461-4406	160
1030	461-4208	160	461-4408	160
950	461-4210	160	461-4410	160
852	461-4213	160	461-4413	160
800	461-4215	160	461-4415	160
780	461-4220	160	461-4420	160
770	461-4221	160	461-4421	160
633	461-4225	160	461-4425	160
589	461-4228	160	461-4428	160
532	461-4230	160	461-4430	160
527	461-4231	160	461-4431	160
515	461-4232	160	461-4432	160
488	461-4233	160	461-4433	160
400	461-4235	160	461-4435	160
355	461-4240	192	461-4440	192
343	461-4241	192	461-4441	192

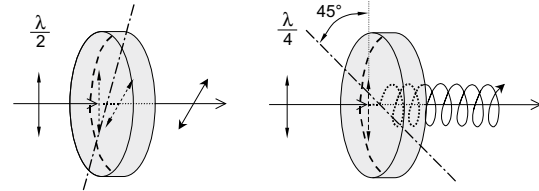
Please contact us for other wavelength, size or precision requirements.

MULTIPLE ORDER WAVEPLATES

FEATURES

- › Made from a single crystalline plate
- › Polished to 1–1.5 mm thickness

Their retardation is only slightly more temperature dependent compared with the zero order ones.



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Nominal thickness of waveplate	1–1.5 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.4%
Laser damage threshold	10 J/cm ² , 10 nsec pulse, 1064 nm typical

Ø12.7 mm WAVEPLATES. Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1550	462-4201D12	90	462-4401D12	90
1064	462-4205D12	90	462-4405D12	90
1053	462-4206D12	90	462-4406D12	90
1030	462-4208D12	90	462-4408D12	90
800	462-4215D12	90	462-4415D12	90
780	462-4220D12	90	462-4420D12	90
633	462-4225D12	90	462-4425D12	90
532	462-4230D12	90	462-4430D12	90
515	462-4232D12	90	462-4432D12	90
355	462-4240D12	95	462-4440D12	95

Please contact us for other wavelength, size or precision requirements.

HOUSING ACCESSORIES

High Precision
Rotation Polarizer,
Waveplate Mount
840-0186

Find more at
EksmaOptics.com



Polarizer Holders
840-0180

Find more at
EksmaOptics.com



Ø20 mm WAVEPLATES. Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1550	462-4201	138	462-4401	138
1064	462-4205	138	462-4405	138
1053	462-4206	138	462-4406	138
1030	462-4208	138	462-4408	138
950	462-4210	138	462-4410	138
852	462-4213	138	462-4413	138
800	462-4215	138	462-4415	138
780	462-4220	138	462-4420	138
770	462-4221	138	462-4421	138
633	462-4225	138	462-4425	138
589	462-4228	138	462-4428	138
532	462-4230	138	462-4430	138
527	462-4231	138	462-4431	138
515	462-4232	138	462-4432	138
448	462-4233	138	462-4433	138
400	462-4235	138	462-4435	138
355	462-4240	143	462-4440	143
343	462-4241	143	462-4441	143
266	462-4245	153	462-4445	153
257	462-4246	153	462-4446	153

Please contact us for other wavelength, size or precision requirements.

MULTIPLE ORDER DUAL WAVELENGTH WAVEPLATES

FEATURES

- Operate at both first and second Nd:YAG laser harmonics
- Retardation tolerance $< \lambda/300$

HOUSING ACCESSORIES

High Precision
Rotation Polarizer,
Waveplate Mount
840-0186

Find more at
EksmaOptics.com



Polarizer Holders
840-0180

Find more at
EksmaOptics.com



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Parallelism	< 10 arcsec
AR coating	$R < 0.5\%$
Nominal thickness of waveplate	0.2-1.2 mm
Laser damage threshold	5 J/cm ² , 10 nsec pulse, 1064 nm typical

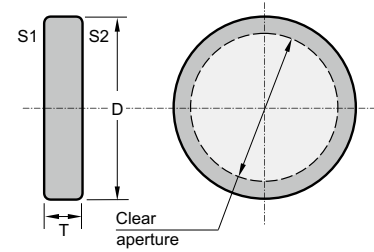
Retardation and Wavelength	Catalogue number	Price, EUR
λ @ 1064nm + $\lambda/2$ @ 532 nm	463-4120	215
λ @ 1064nm + $\lambda/4$ @ 532 nm	463-4140	215
$\lambda/2$ @ 1064nm + λ @ 532 nm	463-4210	215
$\lambda/2$ @ 1064nm + $\lambda/2$ @ 532 nm	463-4220	215
$\lambda/2$ @ 1064nm + $\lambda/4$ @ 532 nm	463-4240	215
$\lambda/4$ @ 1064nm + λ @ 532 nm	463-4410	215
$\lambda/4$ @ 1064nm + $\lambda/2$ @ 532 nm	463-4420	215
$\lambda/4$ @ 1064nm + $\lambda/4$ @ 532 nm	463-4440	215
λ @ 800nm + $\lambda/2$ @ 400nm	463-4121	215
λ @ 800nm + $\lambda/4$ @ 400nm	463-4141	215
$\lambda/2$ @ 800nm + λ @ 400nm	463-4211	215
$\lambda/2$ @ 800nm + $\lambda/2$ @ 400nm	463-4221	215
$\lambda/2$ @ 800nm + $\lambda/4$ @ 400nm	463-4241	215
$\lambda/4$ @ 800nm + λ @ 400nm	463-4411	215
$\lambda/4$ @ 800nm + $\lambda/2$ @ 400nm	463-4421	215
$\lambda/4$ @ 800nm + $\lambda/4$ @ 400nm	463-4441	215

POLARIZATION PLANE ROTATORS

FEATURES

- › Made of crystalline quartz
- › Intended to rotate a beam polarization plane strictly to an appropriate angle using the circular birefringent effect

As compared to a waveplate, a rotator has an intrinsic advantage, being independent of rotation around its own optical axis. It needs no adjustment, only to be installed normal to incident radiation. A polarization plane rotator is normally used for the specific wavelength. It is only slightly dependent on ambient temperature.



Polarization plane rotators for any wavelength from 200 to 2300 nm are available.

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	Normal to faces S1, S2 of rotator
Clear aperture	Ø17 mm
Ring mount outer diameter	D = 25.4 +0.0 / -0.12 mm
Mount thickness	T = 6–20 mm (depending on wavelength and rotation angle)
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$
Parallelism	< 10 arcsec
AR coating	R < 0.2% both sides
Laser damage threshold	5 J/cm ² , 10 nsec pulse, 1064 nm typical

Center wavelength, nm	Rotation angle of polarization plane, deg	Catalogue number	Price, EUR
1064	45	470-4644	215
1064	90	470-4649	215
1030	45	470-4904	215
1030	90	470-4909	215
800	45	470-4804	195
800	90	470-4809	195
780	45	470-4784	195
780	90	470-4789	195
633	45	470-4634	195
633	90	470-4639	195
532	45	470-4534	195
532	90	470-4539	195
515	45	470-4514	195
515	90	470-4519	195
413	45	470-4414	195
413	90	470-4419	195
400	45	470-4044	195
400	90	470-4049	195
355	45	470-4354	195
355	90	470-4359	195
343	45	470-4344	195
343	90	470-4349	195
266	45	470-4264	245
266	90	470-4269	245
257	45	470-4254	245
257	90	470-4259	245
244	45	470-4244	245
244	90	470-4249	245

Please contact us for other size or wavelengths requirements.

HOUSING ACCESSORIES

Kinematic Mirror and Beamsplitter Mount 840-0020

Find more at EksmaOptics.com



Kinematic Positioning Mount 840-0193

Find more at EksmaOptics.com

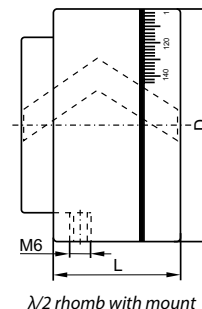
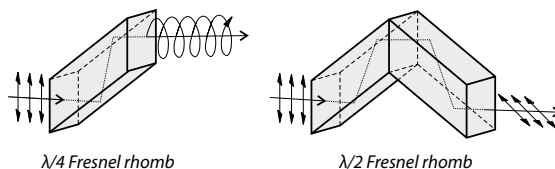


FRESNEL RHOMBS

FEATURES

- Rotate polarization, operates over a wide wavelength range
- $\lambda/2$ rhomb is two optically contacted $\lambda/4$ rhombs

Due to unequal phase shifts arising in orthogonally polarized components of an incident wave at total internal reflection, Fresnel Rhombs are used to alter the polarization type of radiation. They are designed so that two full internal reflections inside a rhomb provide $\pi/2$ phase difference between the orthogonally polarized components of radiation. Hence, if there is a 45° angle between the polarization of the linearly polarized incident plane, the emerging beam is circularly polarized, i. e. the rhomb effect is similar to that of a quarter-waveplate. Therefore, two identical Fresnel rhombs, installed in series, will provide $\pi/2$ phase difference similar to that of a half-waveplate, i. e. the device can rotate the beam polarization plane by 90° , leaving the beam direction invariable.



$\lambda/2$ rhomb with mount

Due to the low dispersion of the refractive index of the materials being used Fresnel rhombs are achromatic over a wide spectral range.

Air-Spaced Fresnel Rhombs are available on request for high power applications.

SPECIFICATIONS

Material	BK7, UV FS
Operating spectral range	BK7: 400–2000 nm UV FS: 210–400 nm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Surface flatness	$\lambda/10$ @ 633 nm (all polished surfaces)
Retardation tolerance	$\pm 2^\circ$
Broad band AR coating	$R < 1\%$
Laser damage threshold	$> 0.5 \text{ J/cm}^2$, 10 nsec pulse, 1064 typical

UNMOUNTED

Material	Wavelength range, nm	Retardation	Clear aperture, mm	Catalogue number	Price, EUR
BK7	600–900	$\lambda/2$	10	481-0210	368
		$\lambda/4$	10	481-0410	186
	400–700	$\lambda/2$	10	481-0212	368
		$\lambda/4$	10	481-0414	186
UV FS	210–400	$\lambda/2$	10	481-1210	491
		$\lambda/4$	10	481-1410	296

Fresnel rhombs with other dimensions and parameters or coatings as well as unmounted rhombs are available upon request.

MOUNTED

Material	Wavelength range, nm	Retardation	Clear aperture, mm	Holder diameter D, mm	Holder length L, mm	Catalogue number	Price, EUR
BK7	600–900	$\lambda/2$	10	73	55	480-0210	659
		$\lambda/4$	10	65	25	480-0410	336
	400–700	$\lambda/2$	10	73	55	480-0212	659
		$\lambda/4$	10	65	25	480-0414	336
UV FS	210–400	$\lambda/2$	10	73	55	480-1210	782
		$\lambda/4$	10	65	25	480-1410	446

Fresnel rhombs with other dimensions and parameters or coatings as well as unmounted rhombs are available upon request.

MOUNTING SUGGESTION



UV & IR Optics

LITHIUM FLUORIDE (LiF) COMPONENTS

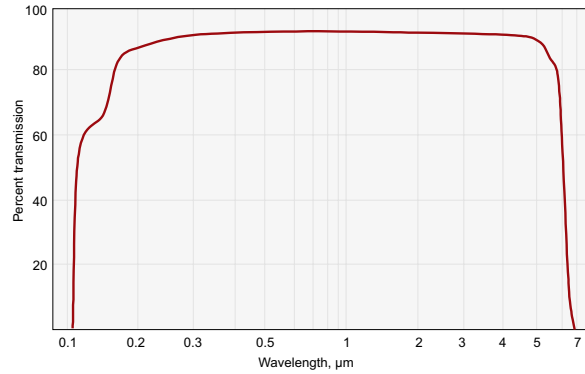
FEATURES

- Optically isotropic, medium hard, hygroscopic, insoluble in water
- Wide transmission range from 150 nm to 6000 nm

Lithium fluoride crystals are well-suited for manufacturing of optical elements (mirrors, windows, lenses) for UV, visible and IR applications.

LiF is very useful for x-ray monochromators and for the study of fundamental properties and defects in crystals.

LiF lenses, Brewster windows, prisms are available upon request.



External transmission of LiF window of 10 mm thickness.

PHYSICAL PROPERTIES

Crystal type	cubic
Lattice constant, Å	a = 4.026
Density, g/cm ³	2.64
Melting point, °C	870
Refractive index @ 1.0 μm	n = 1.387
Transmission range, μm	0.12 – 6

SPECIFICATIONS FOR LiF WINDOWS

Material	optical quality LiF crystal ($\Delta n/cm < 0.5 \times 10^{-5}$)
Spectral range	UV, VIS, IR
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.1 mm
Thickness tolerance	±0.2 mm
Surface flatness	$\lambda/4$ @ 633 nm
Parallelism	< 3 arcmin

HOUSING ACCESSORIES

Optical Component
Mount 830-0037

Find more at
EksmaOptics.com



Diameter, mm	Thickness, mm	Substrate	Catalogue number	Price, EUR
25.4	3.0	UV grade LiF	510-5253	102
38.1	4.0	UV grade LiF	510-5384	215
50.8	6.0	UV grade LiF	510-5506	315

Please contact us for other size, shape or precision requirements.

MAGNESIUM FLUORIDE (MgF₂) COMPONENTS

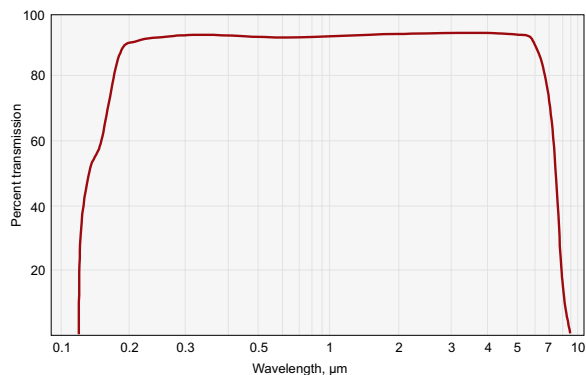
FEATURES

- › Very hard and rugged
- › Resistant to mechanical and thermal shock
- › The only optical material combining a wide spectral transmission band with the birefringence phenomenon

Magnesium fluoride is a proven material for high energy lasers, and in particular for lasers operating in the UV range.

Generally all optical elements are manufactured with the working surface perpendicular to the c-axis of MgF₂ crystal.

MgF₂ lenses, windows, mirrors, prisms are available upon request.



External transmission of MgF₂ window of 10 mm thickness

PHYSICAL PROPERTIES

Crystal type	tetragonal
Lattice constant, Å	a = 4.60, c = 3.06
Density, g/cm ³	3.177
Melting point, °C	1255
Refractive index @ 1.0 μm	n _o = 1.3796, n _e = 1.3852
Transmission range, μm	0.12 – 7

SPECIFICATIONS

Material	optical quality MgF ₂ crystal ($\Delta n/cm < 0.5 \times 10^{-5}$)
Spectral range	UV, IR
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.1 mm
Thickness tolerance	±0.2 mm
Surface flatness	$\lambda/4$ @ 633 nm
Parallelism	< 3 arcmin
Maximum available size of optical components	up to 50 mm

Diameter, mm	Thickness, mm	Substrate	Catalogue number	Price, EUR
25.4	3.0	UV grade MgF ₂	520-5253	130
38.1	5.0	UV grade MgF ₂	520-5385	230
50.8	6.0	UV grade MgF ₂	520-5506	370
25.4	3.0	IR grade MgF ₂	520-6253	110
38.1	5.0	IR grade MgF ₂	520-6385	215
50.8	6.0	IR grade MgF ₂	520-6506	350

Please contact us for other size, shape or precision requirements.

HOUSING ACCESSORIES

Kinematic
Mirror / Beamsplitter
Mounts 840-0032, 840-0033

Find more at
EksmaOptics.com



CALCIUM FLUORIDE (CaF₂) COMPONENTS

FEATURES

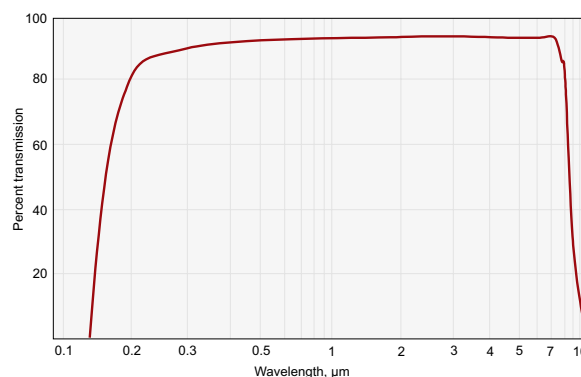
- Useful transmission over the spectral range from 0.2 to 8.0 microns
- Low solubility

Two grades of materials are available: one for UV and the other for IR applications. Low solubility and a wide transmission range makes it useful for many applications, including:

- mirror substrate for UV laser systems;
- substrate for manufacturing windows, lenses for UV, IR applications.

Due to its composition CaF₂ has a much longer useful life than most materials when used in a fluorine environment.

CaF₂ lenses, windows, mirrors, prisms, beamsplitters and beamselectors are available upon request.



External transmission of CaF₂ window of 10 mm thickness

PHYSICAL PROPERTIES

Crystal type	cubic
Lattice constant, Å	a = 5.462
Density, g/cm ³	3.18
Melting point, °C	1360
Refractive index @ 1.0 μm	n = 1.4289
Transmission range, μm	0.13 – 10

CaF₂ WINDOWS

SPECIFICATIONS

Material	optical quality CaF ₂ crystal ($\Delta n/cm < 0.5 \times 10^{-5}$)
Spectral range	UV, VIS, IR
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.13 mm
Thickness tolerance	±0.2 mm
Surface flatness	$\lambda/4$ @ 633 nm
Parallelism	3 arcmin
Maximum available size of optical components up to dia	120 × 20 mm

Diameter, mm	Thickness, mm	Substrate	Catalogue number	Price, EUR
25.4	1.0	UV grade CaF ₂	530-6251	80
25.4	2.0	UV grade CaF ₂	530-6252	76
25.4	3.0	UV grade CaF ₂	530-5253	70
38.1	5.0	UV grade CaF ₂	530-5385	150
50.8	6.0	UV grade CaF ₂	530-5506	250
25.4	3.0	IR grade CaF ₂	530-6253	60
38.1	5.0	IR grade CaF ₂	530-6385	99
50.8	6.0	IR grade CaF ₂	530-6506	175
70.0	10.0	IR grade CaF ₂	530-6710	230
75.0	6.0	IR grade CaF ₂	530-6756	300

Please contact us for other size, shape or precision requirements.

IR GRADE CaF₂ PROTECTIVE WINDOWS FOR SPECTROSCOPY APPLICATION (OPTICALLY POLISHED)

SPECIFICATIONS

Material	optical quality CaF ₂ crystal ($\Delta n/cm < 0.5 \times 10^{-5}$)
Surface quality	80 – 50 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.13 mm
Thickness tolerance	±0.2 mm
Surface flatness	optically polished
Parallelism	<10 arcmin

Diameter, mm	Thickness, mm	Substrate	Catalogue number	Price, EUR
12.0	1	IR grade CaF ₂	530-6121	5

HOUSING ACCESSORIES

Flipping Mirror / Beamsplitter Mounts 840-0155

Find more at
EksmaOptics.com



BARIUM FLUORIDE (BaF₂) COMPONENTS

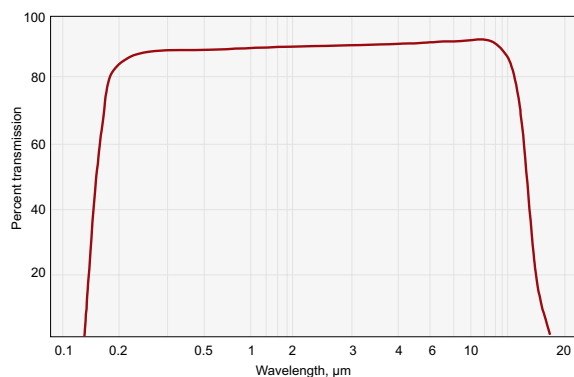
FEATURES

- Useful transmission range covers 0.265 – 10 µm
- Most resistant to high energy radiation among fluorides listed in this catalogue

Barium fluoride is used for optical windows, prisms and lenses transmitting from ultraviolet into infrared, it can be used as an infrared laser window or lens. BaF₂ is recommended for use as a vacuum ultraviolet window where high radiation resistance is required.

BaF₂ is less soluble than LiF, but relatively more soluble than MgF₂ and CaF₂.

BaF₂ lenses, Brewster windows, mirrors, prisms are available on request.



External transmission of BaF₂ window of 10 mm thickness

PHYSICAL PROPERTIES

Crystal type	cubic
Density, g/cm ³	4.89
Melting point, °C	1386
Refractive index	@ 0.265 µm, n = 1.51217 @ 10.3 µm, n = 1.39636
Transmission range, µm	0.15 – 12

BaF₂ WINDOWS

SPECIFICATIONS

Material	BaF ₂
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.25 mm
Thickness tolerance	± 0.2 mm
Surface flatness	1λ per inch @ 633 nm
Parallelism	3 arcmin

Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
25.4	2	540-7252	60
25.4	3	540-7251	60
44.6	3.5	540-7445	100
50.8	3	540-7503	220

Please contact us for other size, shape, precision or coating requirements.

BaF₂ LENSES

SPECIFICATIONS

Material	BaF ₂
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.5 mm
Focal length	± 2% @ 3 µm
Surface irregularity	λ/4 @ 633 nm
Centration	3 arcmin
Maximum available size of optical components	up to Ø100 mm

Diameter, mm	Focal length, mm	Type	Catalogue number	Price, EUR
12.7	25	plano-convex	541-7105	89
25.4	40	plano-convex	541-7204	145
25.4	50	plano-convex	541-7205	134
25.4	75	plano-convex	541-7207	120
25.4	100	plano-convex	541-7210	109
25.4	125	plano-convex	541-7212	109
25.4	150	plano-convex	541-7213	109
25.4	200	plano-convex	541-7214	109
25.4	250	plano-convex	541-7225	109
25.4	300	plano-convex	541-7230	109
25.4	750	plano-convex	541-7275	109
25.4	1000	plano-convex	541-7250	109
12.7	-25	plano-concave	542-7105	89
25.4	-50	plano-concave	542-7205	134
25.4	-75	plano-concave	542-7207	120
25.4	-100	plano-concave	542-7210	109
25.4	-250	plano-concave	542-7225	109
25.4	-1000	plano-concave	542-7250	109
25.4	-2000	plano-concave	542-7270	109

Please contact us for other size, shape or precision requirements.

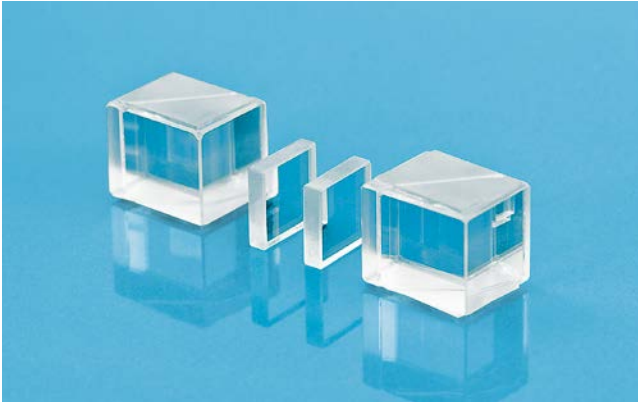
HOUSING ACCESSORIES

Self-Centring Lens Mounts 830-0010

Find more at
EksmaOptics.com



BaF₂ OPTICAL CRYSTALS FOR CROSS POLARIZED WAVE GENERATION



PHYSICAL PROPERTIES

Crystal type	cubic
Density, g/cm ³	5.27
Melting point, °C	1525
Refractive index	@ 0.265 μm, n = 1.51217 @ 10.3 μm, n = 1.39636
Transmission range, μm	0.135 – 15

SPECIFICATIONS

Material	BaF ₂
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.25 mm
Thickness tolerance	± 0.2 mm
Surface flatness	λ/2 @ 633 nm
Parallelism	3 arcmin

UNMOUNTED

Size, mm	Thickness, mm	Orientation	Catalogue number	Price, EUR
10x10	0.5	[011]	540-7105	180
10x10	1.0	[011]	540-7110	180
10x10	1.5	[011]	540-7115	180
10x10	2.0	[011]	540-7120	180
10x10	2.5	[011]	540-7125	180
10x10	3.0	[011]	540-7130	180

Cross-Polarized Wave (XPW) generation is a nonlinear third order process during which fundamental and generated waves have the same frequency; however, generated wave is perpendicularly polarized to pump wave polarization. Phase matching occurs over large bandwidth in XPW generation process. This means the same phase and group velocities for fundamental wave and XPW.

Cross-polarized wave (XPW) generation process is driven by the third order nonlinearity of the crystal, $\chi_{xxxx}^{(3)}$ and the anisotropy $\sigma = (\chi_{xxxx}^{(3)} - 3\chi_{xxyy}^{(3)}) / \chi_{xxxx}^{(3)}$ of the $\chi^{(3)}$ sensor.

The typical optical material used for cross-polarized wave (XPW) generation is Barium Fluoride (BaF₂) crystal with z ([001]) or holographic ([011]) crystallographic orientation. Theory predicts a maximum XPW energy conversion efficiency around 35% when using [011]-cut BaF₂ crystal with a concomitant pulse shortening factor of $\sqrt{3}$ corresponding to a pure third-order nonlinear process [1].

EKSMA OPTICS offers [011] orientation BaF₂ optical crystals (XPW crystals) for Cross-Polarized Wave (XPW) generation. BaF₂ optical crystals with orientation [001] as well CaF₂ optical crystals are available on request.

Characteristics of the different Cross Polarized Wave (XPW) crystals at 2.1 μm [2]

	BaF ₂	CaF ₂	CVD-Diamond
Orientation	h-cut [011]	h-cut [011]	z-cut [001]
Length, mm	2	2	1.2
n	1.464	1.426	2.383
$\chi_{xxxx}^{(3)} \cdot 10^{-22} \text{ m}^2/\text{V}^2$	1.53	0.94	11
σ	-1.2	-0.6	-1.8
GVD, fs ² /mm	-6	-27	63

[1] L. Canova, S. Kourtev, N. Minkovski, A. Jullien, R. Lopez-Martens, O. albert, and S.M. Saltiel, *Appl. Phys. Lett.* 92, 231102 (2008)

[2] Ricci, A., Silva, F., Jullien, A., Cousin, S. L., Austin, D. R., Biegert, J., Lopez-Martens, R. *Generation of High-Fidelity few-cycle pulses at 2.1 μm via cross-polarized wave generation. Optics Express* 9711, 2013.04.22. Vol. 21, No. 8. DOI:10.1364/OE.21.009711

MOUNTED INTO OPEN RING HOLDER

Size, mm	Thickness, mm	Orientation	Catalogue number	Price, EUR
10x10	0.5	[011]	540-7105M	230
10x10	1.0	[011]	540-7110M	230
10x10	1.5	[011]	540-7115M	230
10x10	2.0	[011]	540-7120M	230
10x10	2.5	[011]	540-7125M	230
10x10	3.0	[011]	540-7130M	230

SAPPHIRE (Al₂O₃) COMPONENTS

FEATURES

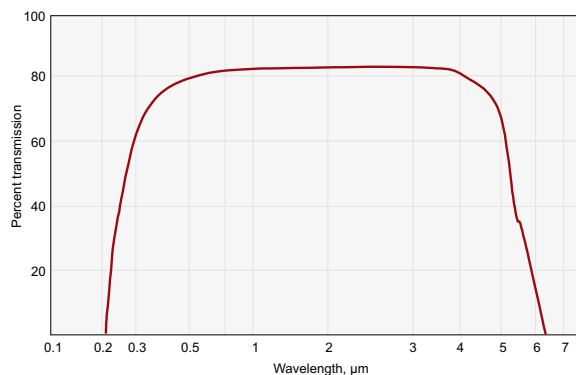
- › The hardest of the oxide crystals
- › Excellent transparency and thermal properties
- › Chemically inert and insoluble
- › Can be safely made much thinner than windows from glass or other crystals

Single crystal sapphire combines excellent optical, physical and chemical properties. Chemically inert and almost insoluble, sapphire in many ways is a superior material for windows. It is transparent from 150 nm up to 6 µm in the middle infrared.

Sapphire exhibits anisotropy in many optical and physical properties. Difference in the index of refraction in orthogonal directions is 0.008.

The high index of sapphire makes magnesium fluoride almost an ideal single layer anti-reflection coating.

Exact parameters depend on the orientation of optical axis or c-axis relative to the surface.



External transmission of Al₂O₃ window of 1 mm thickness

PHYSICAL PROPERTIES

Crystal type	Hexagonal
Density, g/cm ³	3.97
Melting point, °C	2040
Refractive index	@ 0.3 µm, n = 1.814 @ 5 µm, n = 1.623
Transmission range, µm	0.17 – 5.5

SPECIFICATIONS FOR SAPPHIRE WINDOWS

Material	Al ₂ O ₃
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	80% of the diameter
Diameter tolerance	+0.0 / -0.13 mm
Thickness tolerance	±0.2 mm
Surface flatness	1 λ per inch @ 633 nm
Parallelism	3 arcmin
Orientation	C-cut

Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
12.7	0.5	550-7120	26
12.7	1	550-7121	25
12.7	2	550-7122	25
12.7	3	550-7123	25
12.7	4	550-7124	27
12.7	6	550-7126	30
20.0	0.5	550-7200	35
20.0	1	550-7201	35
20.0	2	550-7202	35
25.4	0.5	550-7250	45
25.4	1	550-7251	45
25.4	2	550-7252	45
25.4	3	550-7253	45
25.4	4	550-7254	45
25.4	5	550-7255	50
38.1	2	550-7382	109
50.0	2	550-7502	157
50.0	3	550-7503	165

Please contact us for other size, shape or precision requirements. Coatings are available upon request.

HOUSING ACCESSORIES

Mirror / Beamsplitter
Mount 840-0036

Find more at
EksmaOptics.com



ZINC SELENIDE (ZnSe) COMPONENTS

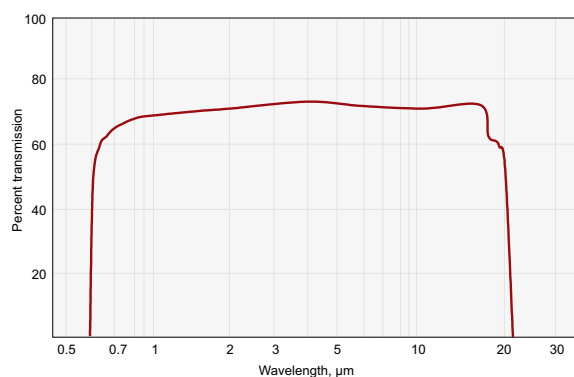
FEATURES

- Low absorption in the red end of the visible spectrum
- Not hygroscopic
- Quite stable in the laboratory environment

Zinc selenide is the most popular material for infrared applications. Due to a very wide transmission range covering 0.6–22 μm chemical vapor deposition grown ZnSe as a high optical quality material is used to manufacture optical components (windows, mirrors, lenses) for high power IR lasers.

Because of a high refractive index, single and double layer antireflection coatings can be unusually effective.

ZnSe Brewster windows, mirrors, prisms, beamsplitters and beamselectors are available upon request.



External transmission of ZnSe window of 10 mm thickness

PHYSICAL PROPERTIES

Crystal type	cubic
Density, g/cm ³	5.27
Melting point, °C	1525
Refractive index	@ 8 – 13 μm $n = 2.417\text{--}2.385$ @ 10.6 μm $n = 2.403$
Transmission range, μm	0.6 – 21
Bulk absorption coefficient, cm ⁻¹	@ 10.6 μm $0.6 - 1.0 \times 10^{-3}$
Coefficient of linear thermal expansion, °C ⁻¹	8.56×10^{-6}

ZnSe WINDOWS

SPECIFICATIONS

Material	ZnSe
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.0 / -0.13 mm
Thickness tolerance	± 0.1 mm
Surface flatness	$\lambda/40$ per inch @ 10.6 μm over clear aperture
Parallelism	3 arcmin
Coating	both surfaces AR coated @ 10.6 μm , $R \leq 0.5\%$ per surface

UNCOATED

Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
12.7	2.0	560-6120	55
12.7	3.0	560-6121	57
25.4	2.0	560-6250	69
25.4	3.0	560-6251	73
38.1	3.0	560-6381	135
50.8	3.0	560-6501	270
50.8	5.0	560-6503	340

COATED AR/AR @ 10.6 μm , AOI=0°

Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
12.7	2.0	560-6122	85
25.4	3.0	560-6253	130
38.1	3.0	560-6383	205
50.8	5.0	560-6505	410
76.2	6.4	560-6766	995

Please contact us for other size, shape, precision or coating requirements.

ZnSe PLANO-CONVEX LENSES

SPECIFICATIONS

Material	ZnSe
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Focal length tolerance	±2%
Diameter tolerance	+0.0 / -0.13 mm
Thickness tolerance	±0.1 mm
Coating	both surfaces AR coated @ 10.6 μm , $R \leq 0.5\%$ per surface

Diameter, mm	Focal length, mm	Catalogue number	Price, EUR
12.7	25.4	561-6122	185
19.1	38.1	561-6192	185
25.4	50	561-6251	195
25.4	63.5	561-6252	195
25.4	75	561-6253	195
25.4	100	561-6254	195
25.4	127	561-6255	190
25.4	150	561-6256	190

Diameter, mm	Focal length, mm	Catalogue number	Price, EUR
25.4	200	561-6257	190
25.4	254	561-6258	190
38.1	63.5	561-6382	315
38.1	127	561-6385	308
38.1	190.5	561-6388	308
50.8	127	561-6502	580
76.2	254	561-6765	1390

Please contact us for other size, shape, precision or coating requirements.

ZnSe MENISCUS LENSES

SPECIFICATIONS

Material	ZnSe
Surface quality	40-20 scratch & dig (MIL-PRF-13830B)
Focal length tolerance	±2%
Diameter tolerance	+0.0 -0.13 mm
Thickness tolerance	±0.1 mm
Clear Aperture	90% of the diameter
Coating	both surfaces AR coated @ 10.6 µm, R≤0.5% per surface

HOUSING ACCESSORIES

Variable Lens Holder
830-0040

Find more at EksmaOptics.com



Diameter, mm	Focal length, mm	Catalogue number	Price, EUR
12.7	38.1	565-6122	215
25.4	25.4	565-6251	224
25.4	38.1	565-6252	224
25.4	50	565-6253	217
25.4	63.5	565-6255	217
25.4	75	565-6256	217
25.4	100	565-6257	217
25.4	127	565-6258	217
38.1	63.5	565-6382	345
38.1	127	565-6385	345
38.1	254	565-6388	345
50.8	127	565-6502	612
76.2	254	565-6765	1450

Please contact us for other size, shape, precision or coatings requirements.

SILICON (Si) COMPONENTS

Coated silicon substrates are most common used as mirrors for CO₂ lasers. Its advantages are good durability, thermal stability and relatively low cost.

The total reflectors are used as rear reflectors and fold mirrors and externally as beam benders in beam delivery systems.

SPECIFICATIONS

Material	Si
Density, g/cm ³	2.33
Operation wavelength	10.6 µm
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Surface flatness	λ/4 @ 633 nm
Clear aperture	>80% of diameter
Diameter tolerance	+0.0 / -0.2 mm
Thickness tolerance	±0.25 mm

SILICON (Si) MIRRORS

SPECIFICATIONS

Coating	protected gold
Reflectivity for unpolarised radiation	> 99%

Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
25.4	3	575-6250	59
38.1	4	575-6380	94
50.8	5	575-6500	159

SILICON (Si) WINDOWS

SPECIFICATIONS

Coating	uncoated
Parallelism	3 arcmin

Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
25.4	3	575-6250U	95
50.8	3	575-6500U	160

GERMANIUM (GE) COMPONENTS

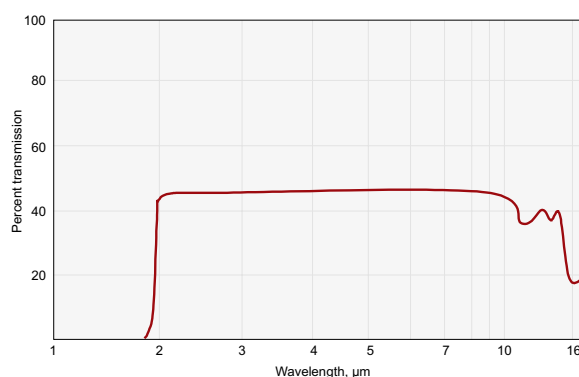
FEATURES

- Wide IR transmission range covering 1.8 – 16 μm
- Opaque in the visible range

Ge based optical components are widely used for IR applications. Ge is well suited for manufacturing windows and lenses for IR applications in lasers and optical systems. Ge components are used with AR coatings because of high surface reflectivity of substrate.

The high refractive index ensures an exceptional single wavelength performance for a "best form" singlet constructed from germanium.

Ge lenses, Brewster windows, mirrors and beamsplitters are available upon request.



External transmission for Ge window of 10 mm thickness

PHYSICAL PROPERTIES

Crystal type	cubic
Lattice constant, Å	$a = 5.657$
Density, g/cm ³	5.33
Melting point, °C	936
Refractive index @ 10.6 μm	$n = 4.0034$
Transmission band, μm	1.8 – 17

SPECIFICATIONS

Material	optical quality Ge crystal ($\Delta n/\text{cm} < 0.5 \times 10^{-5}$)
Surface quality	60 – 40 scratch & dig (MIL-PRF-13830B)
Clear aperture	80% of the diameter
Diameter tolerance	+0.0 / -0.1 mm
Thickness tolerance	± 0.2 mm
Surface flatness	$< 1.5 \lambda$ per inch @ 633 nm
Parallelism	< 3 arcmin

Coating	Diameter, mm	Thickness, mm	Catalogue number	Price, EUR
uncoated	25.4	3.0	580-6023	99
	38.1	4.0	580-6034	210
	50.8	5.0	580-6055	299
AR/AR @ 10.6 μm	25.4	3.0	580-6123	159
	38.1	4.0	580-6134	269
	50.8	5.0	580-6155	370

Please contact us for other sizes or required specifications of coating.

HOUSING ACCESSORIES

Kinematic Mirror and Beamsplitter Mount 840-0020

Find more at
EksmaOptics.com



COATINGS

WINDOWS & FILTERS

MIRRORS

LENSES

PRISMS

POLARIZING OPTICS

UV & IR OPTICS

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POSITIONERS & HOLDERS

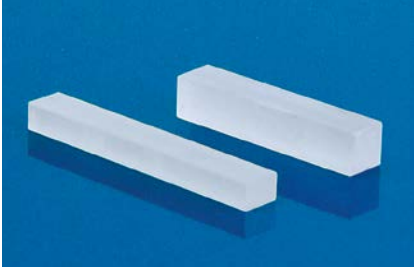
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Nonlinear Crystals

LBO – LITHIUM TRIBORATE



LBO is well suited for various nonlinear optical applications:

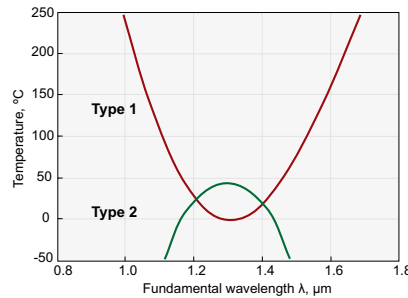
- › frequency doubling and tripling of high peak power pulsed Nd doped, Ti:Sapphire and Dye lasers
- › optical parametric oscillators (OPO) of both Type 1 and Type 2 phase-matching
- › non-critical phase-matching for frequency conversion of CW and quasi-CW radiation.

STANDARD SPECIFICATIONS

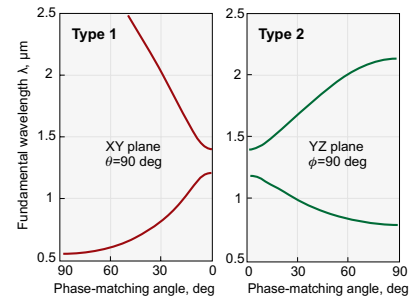
Flatness	$\lambda/8$ at 633 nm
Parallelism	< 20 arcsec
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Clear aperture	90% of full aperture

FEATURES

- › Wide transparency region
- › Broad Type 1 and Type 2
- › Non-critical phase-matching (NCPM) range
- › Small walk-off angle
- › High damage threshold
- › Wide acceptance angle
- › High optical homogeneity



NCPM SHG temperature dependence of LBO



SHG tuning curves of LBO

WE OFFER:

- › Crystals length up to 90 mm and aperture up to 60×60 mm
- › AR, BBAR, P-coatings
- › Different mounting and repolishing services

STANDARD CRYSTALS LIST

Size, mm	θ , deg	ϕ , deg	Coating	Application	Catalogue number	Price, EUR
3x3x10	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-401	245
3x3x15	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-402	325
4x4x10	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-301	510
4x4x15	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-302	630
4x4x20	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-303	745
5x5x10	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-501	655
5x5x15	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-503	765
5x5x20	90	11.6	AR/AR @ 1064+532 nm	SHG @ 1064 nm	LBO-502	940
3x3x15	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-404	325
3x3x20	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-405	405
3x3x30	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-409	710
3x3x50	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-410	1300
4x4x10	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-304	510
4x4x15	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-305	630
4x4x20	90	0	AR/AR @ 1064+532 nm	NCPM SHG @ 1064 nm, T = 149 °C	LBO-306	745
3x3x10	42.2	90	AR/AR @ 1064+532/355 nm	THG @ 1064 nm	LBO-406	245
3x3x15	42.2	90	AR/AR @ 1064+532/355 nm	THG @ 1064 nm	LBO-407	325
4x4x10	42.2	90	AR/AR @ 1064+532/355 nm	THG @ 1064 nm	LBO-307	510
4x4x15	42.2	90	AR/AR @ 1064+532/355 nm	THG @ 1064 nm	LBO-308	630
5x5x10	42.2	90	AR/AR @ 1064+532/355 nm	THG @ 1064 nm	LBO-507	655
5x5x15	42.2	90	AR/AR @ 1064+532/355 nm	THG @ 1064 nm	LBO-508	765

PHYSICAL AND OPTICAL PROPERTIES

Chemical formula	LiB ₃ O ₅		
Crystal structure	orthorhombic, mm2		
Optical symmetry	Negative biaxial		
Space group	Pna2 ₁		
Density	2.47 g/cm ³		
Mohs hardness	6		
Optical homogeneity	∂n = 10 ⁻⁶ cm ⁻¹		
Transparency region at “0” transmittance level	155 – 3200 nm		
Linear absorption coefficient at 1064 nm	< 0.01 % cm ⁻¹		
Refractive indices:	n _x	n _y	n _z
at 1064 nm	1.5656	1.5905	1.6055
at 532 nm	1.5785	1.6065	1.6212
at 355 nm	1.5971	1.6275	1.6430
Sellmeier equations (λ, μm)	n _x ² = 2.4542 + 0.01125 / (λ ² – 0.01135) – 0.01388 λ ² n _y ² = 2.5390 + 0.01277 / (λ ² – 0.01189) – 0.01849 λ ² + 4.3025 × 10 ⁻⁵ λ ⁴ – 2.9131 × 10 ⁻⁵ λ ⁶ n _z ² = 2.5865 + 0.0131 / (λ ² – 0.01223) – 0.01862 λ ² + 4.5778 × 10 ⁻⁵ λ ⁴ – 3.2526 × 10 ⁻⁵ λ ⁶		
Phase matching range Type 1 SHG	554 – 2600 nm		
Phase matching range Type 2 SHG	790 – 2150 nm		
NCPM SHG temperature dependence:			
Type 1 range 950 – 1300 nm	T1 = - 1893.3λ ⁴ + 8886.6λ ³ – 13019.8λ ² + 5401.5λ + 863.9		
Type 1 range 1300 – 1800 nm	T2 = 878.1λ ⁴ – 6954.5λ ³ + 20734.2λ ² – 26378λ + 12020		
Type 2 range 1100 – 1500 nm	T3 = - 21630.6λ ⁴ + 112251λ ³ – 220460λ ² + 194153λ – 64614.5		
NCPM SHG at 1064 nm Type 1 temperature	149 °C		
NCPM SHG at 1319 nm Type 2 temperature	43 °C		
Walk-off angle	7 mrad (Type 1 SHG 1064 nm)		
Thermal acceptance	6.4 K×cm (Type 1 SHG 1064 nm)		
Angular acceptance	6.5 mrad×cm (Type 1 SHG 1064 nm) 248 mrad×cm (Type 1 NCPM SHG 1064 nm)		
Nonlinearity coefficients	d ₃₁ = – (0.98±0.09) pm/V; d ₃₂ = (1.05±0.09) pm/V; d ₃₃ = (0.05±0.006) pm/V		
Effective nonlinearity:			
XY plane	d _{ooe} = d ₃₂ cosφ		
YZ plane	d _{oeo} = d _{eo0} = d ₃₁ cosθ		
Expansion coefficients	α _x = 10.8 × 10 ⁻⁵ K ⁻¹ ; α _y = – 8.8 × 10 ⁻⁵ K ⁻¹ ; α _z = 3.4 × 10 ⁻⁵ K ⁻¹		
Laser induced damage threshold (LIDT)	>5 J/cm ² (>500 MW/cm ²), 1064 nm, 10 ns, 10 Hz		

Please contact EKSMA OPTICS for further information or nonstandard specifications.

RELATED PRODUCTS

LBO crystals for SHG of Yb:KGW/KYW laser frequency conversion. See page 4.42

Crystal Oven TC2

See page 2.28



149 °C temperature is required to achieve Non-Critical Phase Matching (NCPM) in LBO at type 1 SHG of 1064 nm application. **TC2 oven** is specially designed for this purpose (see technical specifications, p. 2.28).

Heatpoint Crystal Oven

See page 2.29



Heatpoint is a compact round oven designed for heating (30 – 80 °C) of humidity sensitive nonlinear crystals. It is used to prevent moisture condensation on crystal faces or for thermostabilization of the crystals.

BBO – BETA BARIUM BORATE



FEATURES

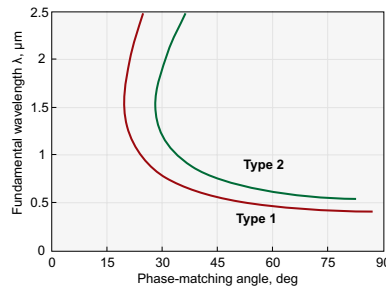
- › Wide transparency region
- › Broad phase-matching range
- › Large nonlinear coefficient
- › High damage threshold
- › Wide thermal acceptance bandwidth
- › High optical homogeneity

As a result of its excellent properties BBO has a number of advantages for different applications:

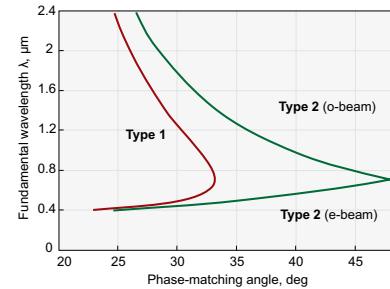
- › harmonic generations (up to fifth) of Nd doped lasers
- › frequency doubling and tripling of ultrashort pulse Ti:Sapphire and Dye lasers
- › optical parametric oscillators (OPO) at both Type 1 (o-o) and Type 2 (e-o) phase-matching
- › frequency doubling of Argon ion and Copper vapour laser radiation
- › electro-optic crystal for Pockels cells
- › ultrashot pulse duration measurements by autocorrelation.

STANDARD SPECIFICATIONS

Flatness	$\lambda/8$ at 633 nm
Parallelism	< 20 arcsec
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Clear aperture	90% of full aperture



SHG tuning curve of BBO



OPO tuning curves of BBO at 355 nm pump

WE OFFER:

- › Crystal aperture up to 25 × 25 mm
- › Crystal length up to 25 mm
- › Thin crystals down to 5 μm thickness
- › AR, BBAR, P-coating
- › BBO with gold electrodes for e/o applications
- › Different mounting and repolishing services

STANDARD CRYSTALS LIST

Size, mm	θ, deg	φ, deg	Coating	Application	Catalogue number	Price, EUR
6×6×0.1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-601H	505
6×6×0.2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-602H	505
6×6×0.5	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-603H	440
6×6×1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-604H	390
6×6×2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-605H	360
6×6×0.1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-609H	505
6×6×0.2	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-610H	505
6×6×0.5	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-611H	440
6×6×1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-612H	390
10×10×0.1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1001H	800
10×10×0.2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1002H	790
10×10×0.5	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1003H	760
10×10×1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1004H	765
10×10×2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1005H	830
10×10×0.1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1009H	800
10×10×0.2	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1010H	790
10×10×0.5	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1011H	760
10×10×1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1012H	785

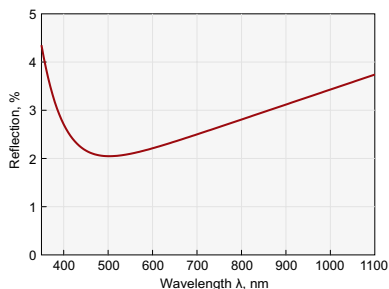


Wide selection of non-standard size and cut angle BBO crystals is available at www.eksmaoptics.com

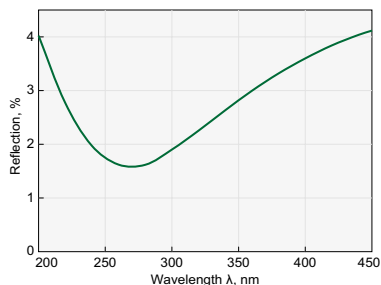


PHYSICAL AND OPTICAL PROPERTIES

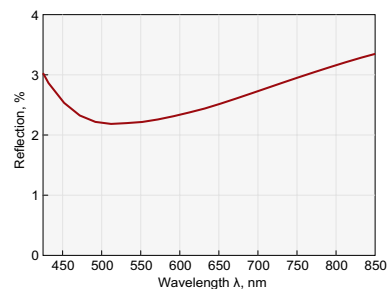
Chemical formula	BaB ₂ O ₄	
Crystal structure	trigonal, 3m	
Optical symmetry	Negative Uniaxial (n _o >n _e)	
Space group	R3c	
Density	3.85 g/cm ³	
Mohs hardness	5	
Optical homogeneity	∂n = 10 ⁻⁶ cm ⁻¹	
Transparency region at "0" transmittance level	189 – 3500 nm	
Linear absorption coefficient at 1064 nm	< 0.1% cm ⁻¹	
Refractive indices	n _o	n _e
at 1064 nm	1.6551	1.5426
at 532 nm	1.6750	1.5555
at 355 nm	1.7055	1.5775
at 266 nm	1.7571	1.6139
at 213 nm	1.8465	1.6742
Sellmeier equations (λ, μm)	$n_o^2 = 2.7366122 + 0.0185720 / (\lambda^2 - 0.0178746) - 0.0143756 \lambda^2$ $n_e^2 = 2.3698703 + 0.0128445 / (\lambda^2 - 0.0153064) - 0.0029129 \lambda^2$	
Phase matching range Type 1 SHG	410 – 3300 nm	
Phase matching range Type 2 SHG	530 – 3300 nm	
Walk-off angle	55.9 mrad (Type 1 SHG 1064 nm)	
Angular acceptance	1.2 mrad × cm (Type 1 SHG 1064 nm)	
Thermal acceptance	70 K × cm (Type 1 SHG 1064 nm)	
Nonlinearity coefficients	d ₂₂ = ± 2.2 pm/V; d ₁₅ = d ₃₁ = ± 0.08 pm/V	
Effective nonlinearity expressions	$d_{oee} = d_{31} \sin\theta - d_{22} \cos\theta \sin 3\varphi$ $d_{eoe} = d_{oee} = d_{22} \cos^2\theta \cos 3\varphi$	
Thermal expansion coefficient	α ₁₁ = 4 × 10 ⁻⁶ K ⁻¹ ; α ₃₃ = 36 × 10 ⁻⁶ K ⁻¹	
Damage threshold for TEM ₀₀	> 0.5 GW/cm ² at 1064 nm, 10 ns ~ 50 GW/cm ² at 1064 nm, 1 ps > 200 GW/cm ² at 800 nm, 100 fs, 50 Hz	



Typical P-coating for BBO SHG@800 nm application



Typical coating for BBO THG@800 nm or SHG@532 nm applications (output face P@266 nm)



Typical coating for BBO SHG@532 nm application (input face P@532 nm)

P-protective coating. It's a single or two layers antireflection coating made at specified wavelength range. Typical reflection values are R≈2% in the mid range, R<4% at the edges. P coating is recommended for ultra-short pulses applications and features low dispersion.

RELATED PRODUCTS

Thin BBO crystals for SHG and THG of Ti:Sapphire laser wavelength
See page 4.35

BBO crystals for SHG of Yb:KGW/KYW laser frequency conversion
See page 4.42

HOUSING ACCESSORIES

Ring Holders for Nonlinear Crystals
See page 2.26

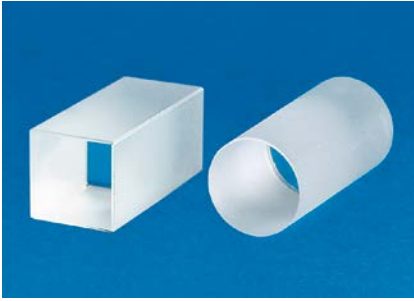


Positioning Mount 840-0199 for Nonlinear Crystal Housing

Accepts crystals with aperture up to 12x12 mm and thickness up to 3 mm.
See page 2.27



KDP / DKDP – POTASSIUM DIDEUTERIUM PHOSPHATE



FEATURES

- › Laser frequency conversion – harmonic generation for high pulse energy, low repetition (<100 Hz) rate lasers
- › Electro-optical modulation
- › Q-switching crystal for Pockels cells

ELECTRO-OPTICAL/Q-SWITCHING APPLICATION

- › EKSMA OPTICS offers highly deuterated $D > 96\%$ **electro-optic crystal** – DKDP for Q-switching application;
- › Standard dimensions of **electro-optic DKDP crystals** for Q-switching are cylinders dia 9x20 mm and dia 12x24 mm however manufacturing of custom size and rectangular shape crystals is available;
- › Gold evaporated or silver paste electrodes are available;
- › **Dielectric thin film AR coatings** for specified laser wavelengths are available;
- › Typical quarter wave voltage 3.4 kV at 1064 nm;
- › Typical contrast ratio between crossed polarizers better than 1:2000;
- › Damage threshold of AR coated DKDP surface $> 5 \text{ J/cm}^2$ at 1064 nm, 10 ns pulses.

FREQUENCY CONVERSION APPLICATIONS

- › **DKDP crystals** are used for second harmonic generation of high pulse energy low repetition rate (<100 Hz) Q-switched and mode-locked Nd:YAG lasers. Cut angle of crystal for operation at room temperature is 36.6° for Type 1 phase matching and 53.7° deg for Type 2 phase matching.
- › **DKDP crystals** are used for third harmonic generation of high pulse energy Q-switched and mode-locked Nd:YAG lasers via sum frequency generation. Cut angle of crystal for operation at room temperature is 59.3° for Type 2 phase matching.

- › Type 1 **DKDP crystals** with non-critical cut angle $\theta = 90^\circ$ are used for fourth harmonic generation (532 nm $\rightarrow$ 266 nm) of high pulse energy Q-switched and mode-locked Nd:YAG lasers. Crystal must be heated at $\sim 50^\circ \text{C}$ temperature to match NCPM conditions.
- › Type 1 **KDP crystals** with close to non-critical cut angle $\theta = 76.5^\circ$ are used for fourth harmonic generation (532 nm $\rightarrow$ 266 nm) of high pulse energy Q-switched and mode-locked Nd:YAG lasers. KDP has lower absorption at UV wavelengths comparing to DKDP.
- › **KDP thin crystals** are used for second harmonic generation of Ti:Sapphire laser radiation or pulse duration measurement in single shot autocorrelators. KDP possesses ~ 2.4 times larger spectral acceptance and correspondingly smaller group velocity mismatch comparing to BBO crystal for SHG of 800 nm, what sometime is very critical parameter for femtosecond wide spectrum pulses.
- › KDP crystals can be supplied by EKSMA OPTICS of aperture up to $\varnothing 80 \text{ mm}$. Actually KDP remains the only solution for harmonic generation of very high intensity femtosecond Ti:Sapphire lasers featuring sub-tera Watt or tera Watt peak power pulses in large $> 30 \text{ mm}$ diameter beams.

STANDARD SPECIFICATIONS

Flatness	$\lambda/6$ at 633 nm
Parallelism	$< 20 \text{ arcsec}$
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Perpendicularity	$< 5 \text{ arcmin}$
Angle tolerance	$< 30 \text{ arcmin}$
Aperture tolerance	$\pm 0.1 \text{ mm}$
Clear aperture	90% of full aperture

STANDARD CRYSTALS LIST

Size, mm	θ , deg	ϕ , deg	Coating	Application	Catalogue number	Price, EUR
15x15x13	36.5	45	AR/AR @ 1064+532 nm	SHG @ 1064 nm, Type 1	DKDP-401	485
15x15x13	53.5	0	AR/AR @ 1064+532 nm	SHG @ 1064 nm, Type 2	DKDP-402	485
12x12x20	59.3	0	AR/AR @ 1064+532 / 355 nm	THG @ 1064 nm, Type 2	DKDP-403	475
12x12x20	53.5	0	AR/AR @ 1064 / 1064+532 nm	SHG @ 1064 nm	DKDP-404	475
15x15x20	53.5	0	AR/AR @ 1064 / 1064+532 nm	SHG @ 1064 nm	DKDP-405	579
15x15x20	59.3	0	AR/AR @ 1064+532 / 355 nm	THG @ 1064 nm	DKDP-406	579
12x12x5	76.5	45	AR/AR @ 532/266 nm	SHG @ 532 nm	KDP-401	405
15x15x7	76.5	45	AR/AR @ 532/266 nm	SHG @ 532 nm	KDP-402	480



Wide selection of non-standard size and cut angle DKDP crystals is available at www.eksmaoptics.com



PHYSICAL AND OPTICAL PROPERTIES

Crystals		KDP	DKDP
Chemical formula		KH_2PO_4	KD_2PO_4
Symmetry		42 m	42 m
Hygroscopicity		high	high
Density, g/cm ³		2.332	2.355
Thermal conductivity, W/cm×K		$k_{11}=1.9 \times 10^{-2}$	$k_{11}=1.9 \times 10^{-2}$ $k_{33}=2.1 \times 10^{-2}$
Thermal expansion coefficients, K ⁻¹		$a_{11}=2.5 \times 10^{-5}$ $a_{33}=4.4 \times 10^{-5}$	$a_{11}=1.9 \times 10^{-5}$ $a_{33}=4.4 \times 10^{-5}$
Transmission range, μm		0.18–1.5	0.2–2.0
Residual absorption, cm ⁻¹ (at 1.06 μm)		0.04	0.005
Measured refractive index (at 1.06 μm)		$n_o=1.4938$ $n_e=1.4599$	$n_o=1.4931$ $n_e=1.4582$
Sellmeier coeff., λ – wavelength in μm		$n^2 = A + \frac{B \lambda^2}{\lambda^2 - C} + \frac{D}{\lambda^2 - E}$	
A	n_o	2.259276	2.2409
	n_e	2.132668	2.1260
B	n_o	13.00522	2.2470
	n_e	3.2279924	0.7844
C	n_o	400	126.9205
	n_e	400	123.4032
D	n_o	0.01008956	0.0097
	n_e	0.008637494	0.0086
E	n_o	0.012942625	0.0156
	n_e	0.012281043	0.0120
Nonlinear coeff. d_{36} , pm/V (at 1.06 μm)		0.43	0.40
Effective nonlinear coefficient			
Type 1		$d_{\text{oe}} = d_{36} \times \sin\theta \times \sin 2\varphi$	
Type 2		$d_{\text{oe}} = d_{36} \times \sin\theta \times \cos 2\varphi$	
Laser damage threshold, GW/cm ² at 1.06 μm		10 ps – 100 1 ns – 10 15 ns – 14.4	250 ps – 6 10 ns – 0.5

PHASE MATCHING ANGLES AND BANDWIDTHS FOR SHG OF 1064 nm

Crystal	KDP		DKDP	
Type of phase matching	Type 1 ooe	Type 2 eoe	Type 1 ooe	Type 2 eoe
Cut angle θ, deg	41.2	59.1	36.6	53.7
Acceptances for crystal of 1 cm length (FWHM):				
Δθ (angular), mrad	1.1	2.2	1.2	2.3
ΔT thermal, K	10	11.8	32.5	29.4
Δλ spectral, nm	21	4.5	6.6	4.2
Walk off, mrad	28	25	25	25

ADP, DADP, RDP, CDA and DCDA crystals
are available upon request!

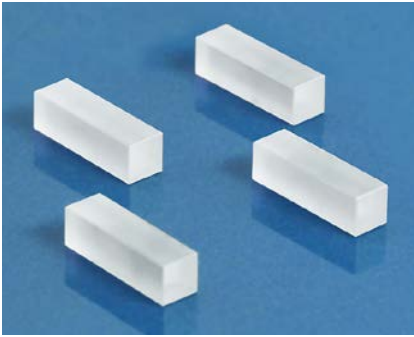
RELATED PRODUCTS

Nonlinear Crystal
Oven CH8
See page 2.30



DKDP and KDP crystals are highly hygroscopic. CH8 and CH9 ovens help to protect hygroscopic crystals from moisture. The raised working temperature (40 – 60 °C) allows to extend crystal lifetime and to keep it thermostable. This helps to stabilise SHG efficiency.

KTP – POTASSIUM TITANYL PHOSPHATE



FEATURES

- › Excellent nonlinear, electro-optical and acousto-optical properties
- › High nonlinear coefficient
- › Wide transparency range
- › Broad angular acceptance
- › Broad thermal acceptance

WE OFFER:

- › Crystal size up to 10×10×20 mm
- › Singleband and dualband AR and BBAR coatings
- › Standard and customised mounts and housings
- › Free technical consulting.

KTP is a standard crystal mostly used in extracavity configuration when a single pass through the crystal is required.

KTP crystals are optimised for SHG intracavity configuration in low peak power CW lasers. Due to the large number of passes through the crystal, low insertion losses and high homogeneity are essential for conversion efficiency. The special highest quality material selected by SHG efficiency mapping of each crystal, fine surface polishing and dual band AR coatings with very low losses allow EK SMA OPTICS to produce KTP crystals suitable for intracavity SHG application.

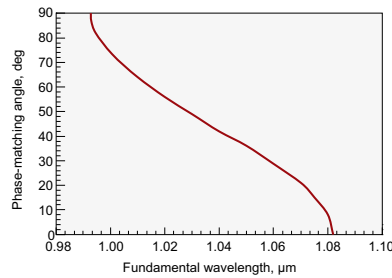


Fig. 1. Type 2 SHG in x-y plane

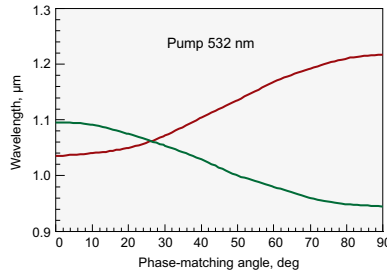


Fig. 3. OPO tuning curve in x-y plane

Fig. 1 represents Type 2 SHG tuning curve of KTP in x-y plane. In x-y plane the slope $\partial(\Delta k)/\partial\theta$ is small. This corresponds to quasi-angular noncritical phase-matching, which ensures the double advantage of a large acceptance angle and a small walk off. Otherwise in x-z plane the slope $\partial(\Delta k)/\partial\lambda$ is almost zero for wavelengths in the range 1.5–2.5 μm and this corresponds to quasi-wavelength noncritical phase-matching, which ensures a large spectral acceptance

STANDARD SPECIFICATIONS

Flatness	$\lambda/8$ at 633 nm
Parallelism	< 20 arcsec
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Clear aperture	90% of full aperture

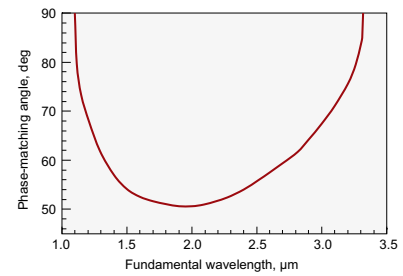


Fig. 2. Type 2 SHG in x-z plane

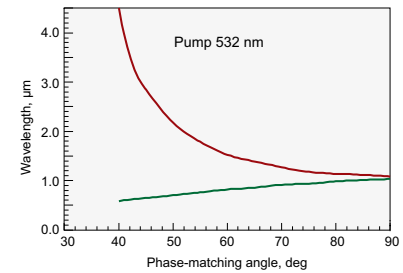


Fig. 4. OPO tuning curve in x-z plane

(see Fig. 2). Wavelength noncritical phase-matching is highly desirable for frequency conversion of short pulses.

As a lasing material for OPG, OPA or OPO, KTP can most usefully be pumped by Nd lasers and their second harmonic or any other source with intermediate wavelength, such as a dye laser (near 600 nm). Fig. 3 and Fig. 4 show the phase-matching angles for OPO/OPA pumped at 532 nm in x-y and x-z plane respectively.

STANDARD CRYSTALS LIST

Size, mm	θ , deg	φ , deg	Coating	Application	Catalogue number	Price, EUR
3x3x5	90	23.5	AR/AR @ 1064+532 nm	SHG @ 1064 nm	KTP-401	76
3x3x10	90	23.5	AR/AR @ 1064+532 nm	SHG @ 1064 nm	KTP-402	109
4x4x6	90	23.5	AR/AR @ 1064+532 nm	SHG @ 1064 nm	KTP-403	118
7x7x9	90	23.5	AR/AR @ 1064+532 nm	SHG @ 1064 nm	KTP-404	529

PHYSICAL PROPERTIES

Crystal structure	orthorhombic
Point group	mm2
Space group	Pna2 ₁
Lattice constants, Å	a = 6.404, b = 10.616, c = 12.814, z = 8
Density, g/cm ³	3.01
Melting point, °C	1172
Transition temperature, °C	936
Mohs hardness	5
Thermal expansion coefficients, °C ⁻¹	a _x = 11×10 ⁻⁶ , a _y = 9×10 ⁻⁶ , a _z = 0.6×10 ⁻⁶
Thermal conductivity, W/cm°C	13
Not hygroscopic	

OPTICAL PROPERTIES

Transparency	350–4400 nm	
Refractive indices	at 1064 nm	at 532 nm
	n _x = 1.7404	n _x = 1.7797
	n _y = 1.7479	n _y = 1.7897
	n _z = 1.8296	n _z = 1.8877
Thermo-optic coefficients in 0.4 – 1.0 μm range	$\partial n_x / \partial T = 1.1 \times 10^{-5} (K)^{-1}$ $\partial n_y / \partial T = 1.3 \times 10^{-5} (K)^{-1}$ $\partial n_z / \partial T = 1.6 \times 10^{-5} (K)^{-1}$	
Wavelength dispersion of refractive indices	$n_x^2 = 3.0067 + 0.0395 / (\lambda^2 - 0.04251) - 0.01247 \times \lambda^2$ $n_y^2 = 3.0319 + 0.04152 / (\lambda^2 - 0.04586) - 0.01337 \times \lambda^2$ $n_z^2 = 3.3134 + 0.05694 / (\lambda^2 - 0.05941) - 0.016713 \times \lambda^2$	

NONLINEAR PROPERTIES

Phase matching range for:	
Type 2 SHG in x-y plane	0.99÷1.08 μm
Type 2 SHG in x-z plane	1.1÷3.4 μm
For Type 2, SHG @ 1064 nm, cut angle θ=90°, φ=23.5°	
Walk-off	4 mrad
Angular acceptances	Δθ = 55 mrad × cm Δφ = 10 mrad × cm
Thermal acceptance	ΔT = 22 K × cm
Spectral acceptance	Δν = 0.56 nm × cm
Up to 80% extracavity SHG efficiency	
Effective nonlinearity	
x-y plane	d _{eo} e = d _{oe} e = d ₁₅ sin ² φ + d ₂₄ cos ² φ
x-z plane	$d_{eo0} = d_{e00} = d_{24}\sin\theta$ $d_{31} = \pm 1.95 \text{ pm/V}$ $d_{32} = \pm 3.9 \text{ pm/V}$ $d_{33} = \pm 15.3 \text{ pm/V}$ $d_{24} = d_{32}$ $d_{15} = d_{31}$
Damage threshold	>500 MW/cm ² <i>for pulses λ=1064 nm, τ=10 ns, 10 Hz, TEM₀₀</i>

RELATED PRODUCTS

Crystal Oven TC2
See page 2.28



Ring Holders for
Nonlinear Crystals
See page 2.26



Heatpoint
Crystal Oven
See page 2.29



Positioning Mount
840-0199 for Nonlinear
Crystal Housing
See page 2.27



KTA – POTASSIUM TITANYLE ARSENATE

FEATURES

- › Significantly reduced absorption in band range of 2.0 – 5.0 μm
- › Broad angular bandwidth
- › Broad temperature bandwidth
- › Low dielectric constants

WE OFFER:

- › KTA crystals size up to 15×15×30 mm
- › AR and BBAR coatings for VIS-IR and mid IR ranges

Potassium titanyle arsenate (KTiOAsO_4), or KTA, is a nonlinear optical crystal for Optical Parametric Oscillation (OPO) application. It has good nonlinear optical and electro-optical properties, e.g. significantly reduced absorption in band range of 2.0 – 5.0 μm , broad angular and temperature bandwidth, low dielectric constants.

PRIMARY APPLICATIONS

- › OPO for mid IR generation – up to 4 μm
- › Sum and Difference Frequency Generation in mid IR range
- › Electro-optical modulation and Q-switching

SPECIFICATIONS

Flatness	$\lambda/8$ at 633 nm
Parallelism	< 20 arcsec
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 15 arcmin
Angle tolerance	< $\pm 0.2^\circ$
Aperture tolerance	± 0.1 mm
Clear aperture	> 90% central area
Transmitting wavefront distortion	less than $\lambda/8$ @ 633 nm

STANDARD CRYSTALS LIST

Size, mm	θ , deg	φ , deg	Coating	Application	Catalogue number	Price, EUR
5×5×20	45	0	AR/AR @ 1064+(1500-4500) nm	Nanosecond OPO @ 1064 nm	KTA-503	1985
5×5×10	45	0	AR/AR @ 1064+(1500-4500) nm	Picosecond OPG/A @ 1064 nm	KTA-504	1060
6×6×1	47	0	AR/AR @ 1.2-2.4/2.6-5.0 μm	DFG @ 1.2-2.4 μm	KTA-601H	675
6×6×3	46	0	AR/AR @ 1030+(1700-5000) nm	OPO @ 1030 nm	KTA-602H	590

PHYSICAL PROPERTIES

Crystal structure	orthorhombic
Point group	mm2
Space group	Pna21
Lattice constants, Å	a = 13.125, b = 6.5716, c = 10.786
Density, g/cm ³	3.45
Melting point, °C	1130
Mohs hardness	5
Thermal conductivity, W/m×K	$k_1=1.8, k_2=1.9, k_3=2.1$
Not hygroscopic	

NONLINEAR & OPTICAL PROPERTIES

Transparency	350 – 5300 nm
Wavelength dispersion of refractive indices	$n_x^2 = 1.90713 + 1.23522 \times \lambda^2 / (\lambda^2 - 0.196922^2) - 0.01025 \times \lambda^2$ $n_y^2 = 2.15912 + 1.00099 \times \lambda^2 / (\lambda^2 - 0.218442^2) - 0.01096 \times \lambda^2$ $n_z^2 = 2.14768 + 1.29559 \times \lambda^2 / (\lambda^2 - 0.227192^2) - 0.01436 \times \lambda^2$
Electro optical constants	$r_{33} = 37.5$ pm/V, $r_{23} = 15.4$ pm/V, $r_{13} = 11.5$ pm/V
Effective nonlinearity	
x-y plane	$d_{\text{oe}} = d_{\text{ee}} = d_{15} \sin^2 \varphi + d_{24} \cos^2 \varphi$
x-z plane	$d_{\text{oeo}} = d_{\text{eoo}} = d_{24} \sin \theta$ $d_{31} = 2.3$ pm/V, $d_{32} = 3.66$ pm/V, $d_{33} = 15.5$ pm/V $d_{24} = 3.64$ pm/V, $d_{15} = 2.3$ pm/V
Damage threshold	> 500 MW/cm ² for pulses $\lambda=1064$ nm, $\tau=10$ ns, 10 Hz, TEM ₀₀

LiNbO₃ – LITHIUM NIOBATE

Lithium Niobate (LiNbO₃) nonlinear optical crystals are well suited for a wide range of applications:

- › Electro-optical modulation
- › Q-switching
- › Laser frequency conversion of wavelengths >1 μm

SPECIFICATIONS

Flatness	λ/8 at 633 nm
Parallelism	< 20 arcsec
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Clear aperture	90% of full aperture

STANDARD CRYSTALS LIST

Size, mm	Orientation	Coating	Catalogue number	Price, EUR
6×6×25	z-cut	AR/AR @ 1064 nm	LNO-602	550
9×9×25	z-cut	AR/AR @ 1064 nm	LNO-901	620

PHYSICAL AND OPTICAL PROPERTIES

Chemical formula	LiNbO ₃
Crystal structure	trigonal
Space group	R3C
Density	4.64 g/cm ³
Mohs hardness	5
Optical homogeneity	~ 5 × 10 ⁻⁵ / cm
Transparency range	420 – 5200 nm
Absorption coefficient	~ 0.1 % / cm @ 1064 nm
Refractive indices at 1064 nm	n _e = 2.146, n _o = 2.220 @ 1300 nm n _e = 2.156, n _o = 2.232 @ 1064 nm n _e = 2.203, n _o = 2.286 @ 632.8 nm
Sellmeier equations (λ, μm)	n _o ² = 4.9048 + 0.11768 / (λ ² - 0.04750) - 0.027169 λ ² n _e ² = 4.5820 + 0.099169 / (λ ² - 0.04443) - 0.021950 λ ²
Thermal expansion coefficient @ 25 °C	//a, 2.0 × 10 ⁻⁶ / K //c, 16.7 × 10 ⁻⁶ / K
Thermal conductivity	~ 5 W/m/K @ 25 °C
Thermal optical coefficient	dn _o /dT = -0.874 × 10 ⁻⁶ / K at 1.4 μm dn _e /dT = 39.073 × 10 ⁻⁶ / K at 1.4 μm

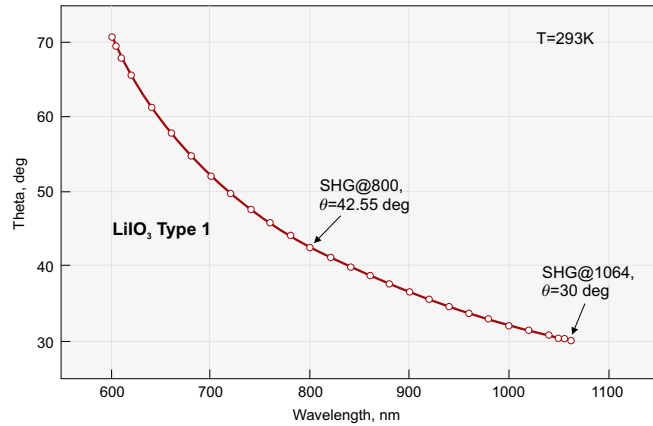
LiIO₃ – LITHIUM IODATE

FEATURES

- › High nonlinear optical coefficients
- › Wide transparency range
- › Low damage threshold – not recommended for high power applications

APPLICATIONS

- › Harmonic generators
- › Thin LiIO₃ for autocorrelation measurements



LiIO₃ Second harmonic generation phase matching

SPECIFICATIONS

Flatness	$\lambda/6$ at 633 nm
Parallelism	< 30 arcsec
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 5 arcmin
Angle tolerance ($\Delta\theta$ & $\Delta\phi$)	< 30 arcmin
Clear aperture	90% of full aperture

PHYSICAL AND OPTICAL PROPERTIES

Crystal structure	hexagonal
Point group	6
Density, g/cm ³	4.487
Mohs hardness	3.5–4.0
Transparency range, nm	280–4000
Absorption at 1064 nm, cm ⁻¹	< 0.05
Refractive indices at 1064 nm	$n_o = 1.8571, n_e = 1.7165$
at 800 nm	$n_o = 1.8676, n_e = 1.7245$
at 532 nm	$n_o = 1.8982, n_e = 1.7480$
Phase matching range for Type 1 SHG, nm	570–4000
Acceptances for Type 1 SHG at 1064 nm	
Angular, mrad×cm	0.77
Spectral, cm ⁻¹ ×cm	12.74
Walk-off for Type 1 SHG at 1064 nm, mrad	74.30
Nonlinear optical coefficient d_{317} , pm/V	4.4 (at 1064 nm)
Effective nonlinearity	$d_{\text{oe}} = d_{15} \sin\theta$
Damage threshold, MW/cm ²	> 100 for TEM ₀₀ , 1064 nm, 10 ns, 10 Hz
Wavelength dispersion of refractive indices (λ – in μm)	
$n_o^2 = 2.083648 + \frac{1.332068 \lambda^2}{\lambda^2 - 0.035306} - 0.008525 \lambda^2 \quad n_e^2 = 1.673463 + \frac{1.245229 \lambda^2}{\lambda^2 - 0.028224} - 0.003641 \lambda^2$	

HOUSING ACCESSORIES

Ring Holders for
Nonlinear Crystals
See page 2.26



Positioning Mount
840-0199 for Nonlinear
Crystal Housing
See page 2.27



ZnGeP₂ / AgGaSe₂ / AgGaS₂ / GaSe – INFRARED NONLINEAR CRYSTALS

OPTICAL
COMPONENTS

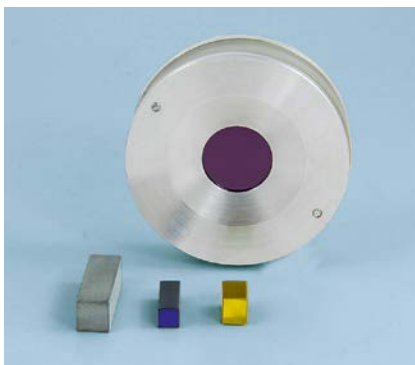
NONLINEAR & LASER
CRYSTALS

ND:YAG LASERLINE
COMPONENTS

FEMTOLINE
COMPONENTS

OPTICAL
SYSTEMS

OPTO-MECHANICAL
COMPONENTS



ZnGeP₂

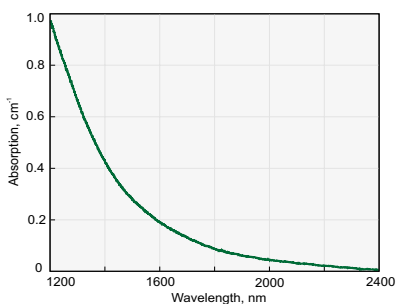
ZnGeP₂ (ZGP) crystal has transmission band edges at 0.74 and 12 μm . However its useful transmission range is from 1.9 to 8.6 μm and from 9.6 to 10.2 μm . ZGP crystal has the largest nonlinear optical coefficient and relatively high laser damage threshold. The crystal is successfully used in diverse applications:

- up-conversion of CO₂ and CO laser radiation to near IR range via harmonics generation and mixing processes;
- efficient SHG of pulsed CO, CO₂ and chemical DF-laser;

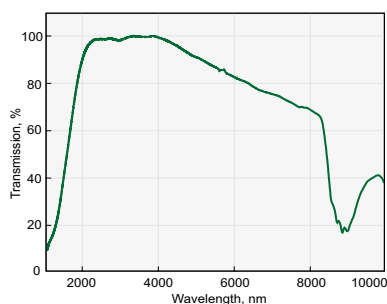
- efficient down conversion of Holmium, Thulium and Erbium and laser wavelengths to mid infrared wavelength ranges by OPO process.

Crystals with high damage threshold BBAR coatings and the lowest absorption coefficient $\alpha < 0.05 \text{ cm}^{-1}$ at pump wavelengths 2.05 – 2.1 μm „o“-polarisation are available for OPO applications.

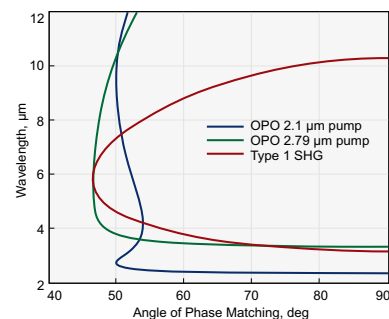
Typical absorption coefficient is $< 0.03 \text{ cm}^{-1}$ at 2.5 – 8.2 μm range.



Absorption spectra of ZnGeP₂ crystal near 2 μm



Transmission spectra of 15 mm long AR coated ZnGeP₂ crystal for OPO @ 2.1 μm



Type 1 OPO and SHG tuning curves in ZnGeP₂

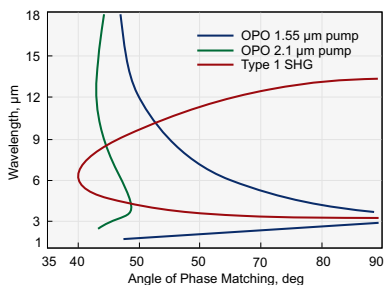
TYPE 1 ZnGeP₂ CRYSTALS FOR OPO AT 3.5-5 μm RANGE PUMPED AT ~2.1 μm

Size, mm	θ , deg	ϕ , deg	Coating	Application	Catalogue number
7x5x15	54	0	AR @ 2.1 μm + BBAR @ 3.5-5 μm	OPO@2.1 $\rightarrow$ 3.5-5 μm	ZGP-401
7x5x20	54	0	AR @ 2.1 μm + BBAR @ 3.5-5 μm	OPO@2.1 $\rightarrow$ 3.5-5 μm	ZGP-402
7x5x25	54	0	AR @ 2.1 μm + BBAR @ 3.5-5 μm	OPO@2.1 $\rightarrow$ 3.5-5 μm	ZGP-403

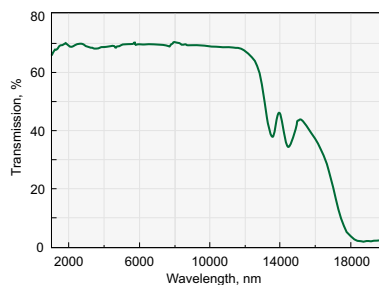
AgGaSe₂

AgGaSe₂ has band edges at 0.73 and 18 μm . Its useful transmission range of 0.9–16 μm and wide phase matching capability provide excellent potential for OPO applications when pumped by a variety of currently available lasers. Tuning from 2.5–12 μm has been

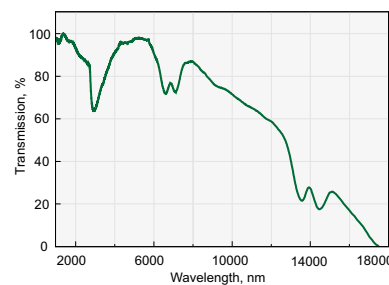
obtained when pumping by Ho:YLF laser at 2.05 μm ; as well as NCPM operation from 1.9–5.5 μm when pumping at 1.4–1.55 μm . Efficient SHG of pulsed CO₂ laser has been demonstrated.



Type 1 OPO and SHG tuning curves in AgGaSe₂



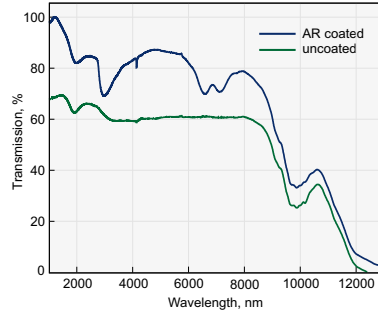
Transmission spectra of 18 mm long uncoated AgGaSe₂ crystal



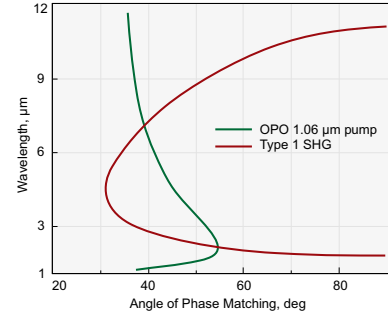
Transmission spectra of 25 mm long AR coated AgGaSe₂ crystal

AgGaS₂

AgGaS₂ is transparent from 0.53 to 12 μm . Although nonlinear optical coefficient is the lowest among the above mentioned infrared crystals, its high short wavelength transparency edging at 550 nm is used in OPOs pumped by Nd:YAG laser; in numerous difference frequency mixing experiments using diode, Ti:Sapphire, Nd:YAG and IR dye lasers covering 3–12 μm range; direct infrared countermeasure systems, and SHG of CO₂ laser.



Transmission spectra of 14 mm long AR coated and uncoated AgGaS₂ crystal used for OPO pumped by Nd:YAG laser



Type 1 OPO and SHG tuning curves in AgGaS₂

LIST OF STANDARD AgGaS₂ CRYSTALS

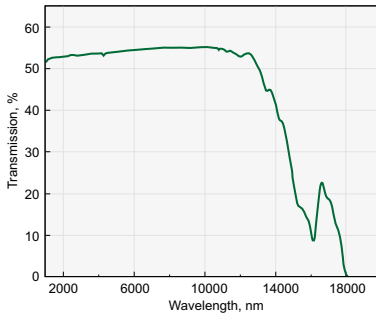
Size, mm	θ , deg	φ , deg	Coating	Application	Catalogue number	Price, EUR
5×5×1	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm -> 2.4-11 μm	AGS-401H	835
6×6×2	50	0	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm -> 2.4-11 μm	AGS-402H	1345
5×5×0.4	34	45	BBAR/BBAR @ 3-6 / 1.5-3 μm	SHG @ 3-6 μm , Type 1	AGS-403H	995
5×5×0.4	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm -> 2.4-11 μm	AGS-404H	995
8×8×0.4	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm , Type 1	AGS-801H	2340
8×8×1	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm , Type 1	AGS-802H	2140

Crystals are mounted into open ring holders (see page 2.26).

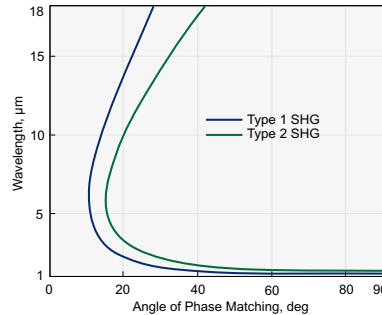
GaSe

GaSe has band edges at 0.65 and 18 μm . GaSe has been successfully used for efficient SHG of CO₂ laser, for SHG of pulsed CO, CO₂ and chemical DF-laser ($\lambda = 2.36 \mu\text{m}$) radiation; up conversion of CO and CO₂ laser radiation into the visible range; infrared pulses generation via difference frequency mixing of Neodymium

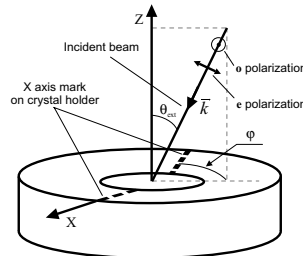
and infrared dye laser or (F⁻)-centre laser pulses; OPG light generation within 3.5–18 μm ; efficient TeraHertz generation in 100–1600 μm range. It is impossible to cut crystals for certain phase matching angles because of material structure (cleave along (001) plane) limiting areas of applications.



Transmission spectra of 17 mm long uncoated GaSe crystal



Type 1 and Type 2 SHG tuning curves in GaSe



GaSe, Z-Cut

Clear aperture, mm	Thickness, μm	Holder, mm	Catalogue number	Price, EUR
Ø7	10	Ø25.4	GaSe-10H1	1950
Ø7	30	Ø25.4	GaSe-30H1	1625
Ø7	100	Ø25.4	GaSe-100H1	1475
Ø7	500	Ø25.4	GaSe-500H1	1460
Ø7	1000	Ø25.4	GaSe-1000H1	1635
Ø7	2000	Ø25.4	GaSe-2000H1	1810

Please note that from now all standard GaSe crystals are provided mounted into Ø25.4 mm ring holders. Crystals could be mounted into Ø40 mm holders under your request.

RELATED PRODUCTS

Ring Holders for Nonlinear Crystals
See page 2.26



Optical nonlinear crystals ZnGeP₂, AgGaSe₂, AgGaS₂, GaSe have gained tremendous interest for middle and deep infrared applications due to their unique features. The crystals have large effective optical nonlinearity, wide spectral and angular acceptances, broad

transparency range, non-critical requirements for temperature stabilization and vibration control, are well mechanically processed (except GaSe).

PHYSICAL PROPERTIES

Crystal		ZnGeP ₂	AgGaSe ₂	AgGaS ₂	GaSe
Crystal Symmetry		Tetragonal	Tetragonal	Tetragonal	Hexagonal
Point Group		42m	42m	42m	62m
Lattice Constants, Å	a c	5.465 10.771	5.9901 10.8823	5.757 10.305	3.742 15.918
Density, g/cm ³		4.175	5.71	4.56	5.03

OPTICAL PROPERTIES

Crystal		ZnGeP ₂	AgGaSe ₂	AgGaS ₂	GaSe
Optical transmission, μm		0.74–12	0.73–18	0.53–12	0.65–18
Indices of Refraction at					
1.06 μm	n _o n _e	3.2324 3.2786	2.7005 2.6759	2.4508 2.3966	2.9082 2.5676
5.3 μm	n _o n _e	3.1141 3.1524	2.6140 2.5823	2.3954 2.3421	2.8340 2.4599
10.6 μm	n _o n _e	3.0725 3.1119	2.5915 2.5585	2.3466 2.2924	2.8158 2.4392
Absorption Coefficient, cm ⁻¹ at					
1.06 μm		3.0	<0.02	<0.09	0.25
2.5 μm		0.03	<0.01	0.01	0.05
5.0 μm		0.02	<0.01	0.01	0.05
7.5 μm		0.02	—	0.02	0.05
10.0 μm		0.4	—	<0.6	0.05
11.0 μm		0.8	—	0.6	0.05

NONLINEAR OPTICAL PROPERTIES

Crystal		ZnGeP ₂	AgGaSe ₂	AgGaS ₂	GaSe
Laser damage threshold, MW/cm ²		60	25	10	28
at pulse duration, ns		100	50	20	150
at wavelength, μm		2.05	10.6	1.06	9.3
Nonlinearity, pm/V		111	43	31	63
Phase matching angle for Type 1 SHG at 10.6 μm, deg		76	55	67	14
Walk-off angle at 5.3 μm, deg		0.57	0.67	0.85	3.4

THERMAL PROPERTIES

Crystal		ZnGeP ₂	AgGaSe ₂	AgGaS ₂	GaSe
Melting point, °C		1298	851	998	1233
Thermal Expansion Coefficient, 10 ⁻⁶ /°K	⊥	17.5 ^(a)	23.4 ^(c)	12.5	9.0
	⊥	9.1 ^(b)	18.0 ^(d)		
		1.59 ^(a)	-6.4 ^(c)	-13.2	8.25
		8.08 ^(b)	-16.0 ^(d)		

a) at 293–573 K, b) at 573–873 K, c) at 298–423 K, d) at 423–873 K

SELMEIER EQUATIONS FOR CALCULATION OF INDICES OF REFRACTION

Crystal		A	B	C	D	E	F	Expression
ZnGeP ₂	n _o	8.0409	1.68625	0.40824	1.2880	611.05	—	$n^2 = A + B\lambda^2 / (\lambda^2 - C) + D\lambda^2 / (\lambda^2 - E)$
	n _e	8.0929	1.8649	0.41468	0.84052	452.05	—	
AgGaSe ₂	n _o	6.8507	0.4297	0.15840	0.00125	—	—	$n^2 = A + B / (\lambda^2 - C) - D\lambda^2$
	n _e	6.6792	0.4598	0.21220	0.00126	—	—	
AgGaS ₂	n _o	3.3970	2.3982	0.09311	2.1640	950.0	—	$n^2 = A + B / (1 - C/\lambda^2) + D / (1 - E/\lambda^2)$
	n _e	3.5873	1.9533	0.11066	2.3391	1030.7	—	
GaSe	n _o	7.443	0.405	0.0186	0.0061	3.1485	2194	$n^2 = A + B/\lambda^2 + C/\lambda^4 + D/\lambda^6 + E/(1 - F/\lambda^2)$
	n _e	5.76	0.3879	-0.2288	0.1223	1.855	1780	

BBO / LBO / KDP / LiIO₃ / AgGaS₂ / GaSe – ULTRATHIN NONLINEAR CRYSTALS



Thin crystals are used in different applications with femtosecond pulses:

- Harmonic generation (SHG, SFG)
- Optical parametric generation and amplification (OPG, OPA)
- Difference frequency generation (DFG)
- Pulse width measurements by auto and cross correlation
- THz frequency generation (in GaSe crystal)

The propagation of an ultrashort optical pulses through the crystal results in a delay of the pulses because of Group Velocities Mismatch (GVM), a duration broadening because of Group Delay Dispersion (GDD) and a frequency chirp. Unfortunately those effects forces to limit nonlinear crystal thickness in frequency generation schemes.

For two collinearly propagating pulses with different group velocities their quasistatic interaction length (L_{qs}) is defined as distance over which they separate by a path equal to the one of the pulses duration (or to the desired pulse duration):

$$L_{qs} = \tau / \text{GVM} ;$$

where GVM is the group velocity mismatch and τ is the duration of the pulse. GVM calculations are presented for the most popular Type 1 phase matching applications for different crystals in Table 2.

Optimal BBO, LBO, KDP and LiIO₃ crystal thicknesses which are limited by GVM for Type 1 SHG of 800 nm at different fundamental pulse duration are presented in the Table 3. Also effective coefficients and phase matching angles at room temperature (20 °C) are calculated. If longer crystal will be used this will cause second harmonic pulse broadening to the duration longer than fundamental

pulse duration (or desired pulse duration).

Group delay dispersion (GDD) has an important impact on the propagation of pulses, because a pulse always has certain spectral width, so that dispersion will cause its frequency components to propagate with different velocities. In case of crystals where we have normal dispersion when refractive index decreases with increasing wavelength this leads to a lower group velocity of higher-frequency components, and thus to a positive chirp.

The frequency dependence of the group velocity also has an influence on the pulse duration. If the pulse is initially unchirped, dispersion in a crystal will always increase its duration. This is called dispersive pulse broadening. For an originally unchirped Gaussian pulse with the duration τ_0 , the pulse duration is increased according to:

$$t = \tau_0 \sqrt{1 + \left(\frac{4 \ln 2 \cdot D \cdot L}{\tau_0^2} \right)^2}$$

L – thickness of the crystal in mm. D – second order group delay dispersion or dispersion parameter. Table 1 gives D parameter for Type 1 phase matching SHG @ 800 nm for 800 nm pulse with „o“ polarization and 400 nm pulse with „e“ polarization in different crystals.

Table 1. D parameter for Type 1 SHG @ 800 nm orientation crystals for 800 nm (o-pol) and 400 nm (e-pol) pulses

Crystal	D at 800 nm	D at 400 nm
BBO	75 fsec ² /mm	196 fsec ² /mm
LBO	47 fsec ² /mm	128 fsec ² /mm
KDP	27 fsec ² /mm	107 fsec ² /mm
LiIO ₃	196 fsec ² /mm	589 fsec ² /mm

We may calculate that spectrum limited initial 30 fsec Gaussian pulse at 400 nm will be broadened to 35 fsec pulse after passing 1 mm thickness BBO crystal.

Table 2. Group velocity mismatch between shortest and longest wave pulse for Type 1 phase matching

Crystal	SFM 800+266 nm	SFM 800+400 nm	SHG 800 nm	SHG 1030 nm	SHG 1064 nm	DFG 1.26-2.18 → 3 μm	DFG 1.48-1.74 → 10 μm
BBO	2074 fs/mm	737 fs/mm	194 fs/mm	94 fs/mm	85 fs/mm	–	–
LBO	–	448 fs/mm	123 fs/mm	51 fs/mm	44 fs/mm	–	–
KDP	–	370 fs/mm	77 fs/mm	1 fs/mm	-7 fs/mm	–	–
LiIO ₃	–	–	559 fs/mm	285 fs/mm	262 fs/mm	–	–
AgGaS ₂	–	–	–	–	–	170 fs/mm	-10 fs/mm

Table 3. Quasistatic interaction length for Type 1 SHG of 800 nm

Crystal	200 fs	100 fs	50 fs	20 fs	10 fs	Cut angles θ, φ	Coefficient deff
BBO	1.0 mm	0.5 mm	0.26 mm	0.1 mm	0.05 mm	29.2°, 90°	2.00 pm/V
LBO	1.6 mm	0.8 mm	0.4 mm	0.16 mm	0.08 mm	90°, 31.7°	0.75 pm/V
KDP	2.6 mm	1.3 mm	0.6 mm	0.26 mm	0.13 mm	44.9°, 45°	0.30 pm/V
LiIO ₃	0.4 mm	0.18 mm	0.01 mm	0.04 mm	0.018 mm	42.5°, 0°	3.59 pm/V

FREE STANDING CRYSTALS

The crystals of thickness down to 100 µm can be supplied as free standing crystals not attached to the support. However the ring mounts are highly recommended for safe handling of these thin crystals. The tolerance

is ±50 µm for crystals of thickness down to 300 µm and ±20 µm for crystals of thickness down to 100 µm.

GaSe crystal is supplied glued in to dia Ø40 mm ring holder only.

Crystal	Minimal aperture	Maximal aperture	Minimal thickness
BBO	2×2 mm	25×25 mm	0.1 mm
LBO	2×2 mm	60×60 mm	0.1 mm
KDP	2×2 mm	Ø75 mm	0.1 mm*
LiIO ₃	2×2 mm	50×50 mm	0.1 mm*
AgGaS ₂	5×5 mm	20×20 mm	0.1 mm
GaSe	Ø5 mm	Ø19 mm	0.01 mm

* the thickness should be about 0.5 mm for max aperture KDP and LiIO₃

OPTICALLY CONTACTED CRYSTALS

BBO crystals of thickness less than 100 µm can be supplied optically contacted on UV Fused Silica substrates sizes 10×10×2 mm or

12×12×2 mm. Other sizes of substrates are also available on request. The tolerances of BBO crystal thickness is +10/-5 µm.

Crystal	Minimal aperture	Maximal aperture	Minimal thickness
BBO	5×5 mm	18×18 mm	10±5 µm

EKSMA OPTICS provides various AR, BBAR and protective coatings for all free standing crystals and optically contacted crystals. Ring mounts made from anodized aluminium and teflon are available for safe and convenient handling of ultrathin crystals.

STANDARD SPECIFICATIONS OF CRYSTALS

Crystals	BBO, LBO	KDP, LiIO ₃ , AgGaS ₂	GaSe
Flatness	λ/6 at 633 nm	λ/4 at 633 nm	cleaved perpendicularly to optical axis. Polish is not available
Parallelism	< 10 arcsec	< 30 arcsec	
Angle tolerance	< 15 arcmin	< 30 arcmin	
Surface quality	10 – 5 scratch/dig	20 – 10 scratch/dig	

RELATED PRODUCTS

Other Ultrahin BBO crystals available. See pages 4.35; 4.42

Ring Holders for
Nonlinear Crystals
See page 2.26



Positioning Mount
840-0199 for Nonlinear
Crystal Housing
See page 2.27



Laser Crystals

NONLINEAR CRYSTALS

LASER CRYSTALS

TERAHERTZ CRYSTALS

RAMAN CRYSTALS

POSITIONERS & HOLDERS

CRYSTAL OVENS

Nd:YAG – NEODYMIUM DOPED YTTRIUM ALUMINIUM GARNET



Nd:YAG crystal is the most popular lasing media for solid-state lasers. EKSMA OPTICS offers standard specifications high optical quality Nd:YAG rods with high damage threshold AR @ 1064 nm coatings.

PROPERTIES OF 1.0% Nd:YAG AT 25 °C

Formula	$Y_{2.97}Nd_{0.03}Al_5O_{12}$
Crystal structure	Cubic
Density	4.55 g/cm ³
Melting point	1970 °C
Mohs hardness	8.5
Transition	$^4F_{3/2} \rightarrow ^4I_{11/2}$ @ 1064 nm
Fluorescence lifetime	230 µs for 1064 nm
Thermal conductivity	0.14 Wcm ⁻¹ K ⁻¹
Specific heat	0.59 Jg ⁻¹ K ⁻¹
Thermal expansion	6.9×10^{-6} °C ⁻¹
$\partial n / \partial t$	7.3×10^{-6} °C ⁻¹
Young's modulus	3.17×10^4 Kg/mm ²
Poisson ratio	0.25
Thermal shock resistance	790 Wm ⁻¹
Refractive index	1.818 @ 1064 nm

STANDARD RODS SIZES

Diameter, mm	Length, mm	Doping, %	Wedge of the ends, deg	Catalogue number	Price, EUR
3	53	0.9	0/0	E-Y-3-0.9-A/A	215
3	65	0.8	0/0	E-Y-3-0.8-A/A	265
3	65	1.1	0/0	E-Y-3-1.1-A/A	325
4	65	0.8	3/3 parallel	E-Y-4-0.8-A/A	530
4	65	1.1	3/3 parallel	E-Y-4-1.1-A/A	530
6.35	85*	1.1	3/3 parallel	E-Y-6.35-1.1-A/A	890
8	85*	1.1	3/3 parallel	E-Y-8-1.1-A/A	1340
10	85*	1.1	3/3 parallel	E-Y-10-1.1-A/A	2200
12	100*	0.8	3/3 parallel	E-Y-12-0.8-A/A	4740
12	100*	1.1	3/3 parallel	E-Y-12-1.1-A/A	4740

* rods with barrel grooving, except 10 mm at both ends of the rod without grooving.

RELATED PRODUCTS

Laser Safety Eyewear

See page 1.17



Visualizator 990-0840

See page 1.17



SPECIFICATIONS OF STANDARD Nd:YAG LASER RODS

Nd Doping Level	0.8% or 1.1%
Orientation	<111> crystalline direction
Surface Quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Surface Flatness	$\lambda/10$ at 633 nm
Parallelism	< 10 arcsec
Perpendicularity	< 5 arcmin for plano/plano ends
Diameter Tolerance	+0 / -0.05 mm
Length Tolerance	+1 / -0.5 mm
Clear Aperture	> 90 % of full aperture
Chamfers	0.1 mm at 45 deg
Coating	both sides coated AR @ 1064 nm, R < 0.2%, AOI = 0 deg
Barrel grooving	all dia 6.35, 8, 10, 12 mm rods with barrel grooving

Yb:KGW / Yb:KYW – Yb-DOPED POTASSIUM GADOLINIUM TUNGSTATE



FEATURES

- › High absorption coefficient @ 981 nm
- › High stimulated emission cross section
- › Low laser threshold
- › Extremely low quantum defect $\lambda_{\text{pump}}/\lambda_{\text{se}}$
- › Broad polarized output at 1023–1060 nm
- › High slope efficiency with diode pumping (~60%)
- › High Yb doping concentration

APPLICATIONS

- › Yb:KGW and Yb:KYW thin (100–150 μm) crystals are used as lasing materials to generate ultrashort (hundreds of fsec) high power (>22 W) pulses. Standard pumping @ 981 nm, output: 1023–1060 nm
- › Yb:KGW and Yb:KYW can be used as ultrashort pulses amplifiers
- › Yb:KGW and Yb:KYW are some of the best materials for high power thin disk lasers

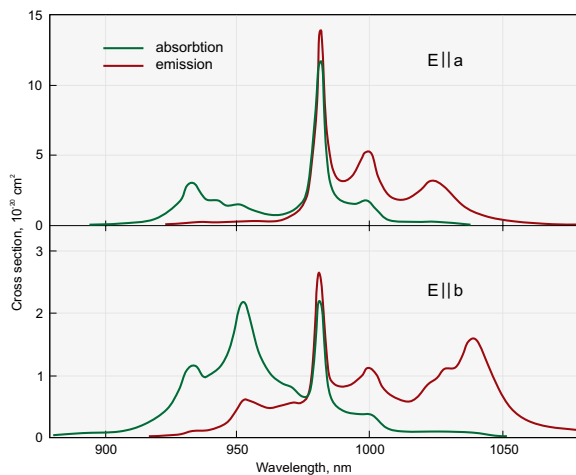
Yb-Doped Potassium Gadolinium Tungstate (**Yb:KGd(WO₄)₂**) and Yb-doped Potassium Itrium Tungstate (**Yb:KY(WO₄)₂**) single crystals are the laser crystals for diode or laser pumped solid-state laser applications.

Custom manufacturing capabilities

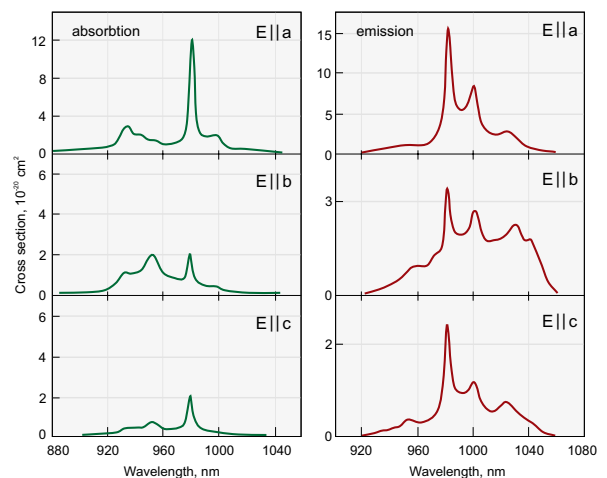
- › Various shapes (slabs, rods, cubes)
- › Different dopant levels
- › Diversified coatings

PROPERTIES OF Yb:KGW AND Yb:KYW

Name	Yb:KGW	Yb:KYW
Yb ³⁺ concentration	0.5–5%	0.5–100%
Crystal structure	monoclinic	monoclinic
Point group	C2/c	C2/c
Lattice parameters	a=8.095 Å, b=10.43 Å, c=7.588 Å, $\beta=94.43^\circ$	a=8.05 Å, b=10.35 Å, c=7.54 Å, $\beta=94^\circ$
Thermal expansion	$\alpha_a=4 \times 10^{-6}/^\circ\text{C}$, $\alpha_b=3.6 \times 10^{-6}/^\circ\text{C}$, $\alpha_c=8.5 \times 10^{-6}/^\circ\text{C}$	—
Thermal conductivity	$K_a=2.6 \text{ W/mK}$, $K_b=3.8 \text{ W/mK}$, $K_c=3.4 \text{ W/mK}$	—
Density	7.27 g/cm ³	6.61 g/cm ³
Mohs' hardness	4–5	4–5
Melting temperature	1075 °C	—
Transmission range	0.35–5.5 μm	0.35–5.5 μm
Refractive indices ($\lambda=1.06 \mu\text{m}$)	$n_g=2.037$, $n_p=1.986$, $n_m=2.033$	—
Thermo-optic coefficients @ 1064 nm	$\partial n_p/\partial T = -15.7 \times 10^{-6} \text{ K}^{-1}$ $\partial n_m/\partial T = -11.8 \times 10^{-6} \text{ K}^{-1}$ $\partial n_g/\partial T = -17.3 \times 10^{-6} \text{ K}^{-1}$	For 20% Yb:KYW $\partial n_p/\partial T = -13.08 \times 10^{-6} \text{ K}^{-1}$ $\partial n_m/\partial T = -7.61 \times 10^{-6} \text{ K}^{-1}$ $\partial n_g/\partial T = -11.83 \times 10^{-6} \text{ K}^{-1}$
Laser wavelength	1023–1060 nm	1025–1058 nm
Fluorescence lifetime	0.3 ms	0.3 ms
Stimulated emission cross section ($E a$)	$2.6 \times 10^{-20} \text{ cm}^2$	$3 \times 10^{-20} \text{ cm}^2$
Absorption peak and bandwidth	$\alpha_a=26 \text{ cm}^{-1}$, $\lambda=981 \text{ nm}$, $\Delta\lambda=3.7 \text{ nm}$	$\alpha_a=40 \text{ cm}^{-1}$, $\lambda=981 \text{ nm}$, $\Delta\lambda=3.5 \text{ nm}$
Absorption cross section	$1.2 \times 10^{-19} \text{ cm}^2$	$1.33 \times 10^{-19} \text{ cm}^2$
Lasing threshold	35 mW	70 mW
Stark levels energy (in cm ⁻¹) of the ² F _{5/2} manifolds of Yb ³⁺ @ 77K	10682, 10471, 10188	10695, 10476, 10187
Stark levels energy (in cm ⁻¹) of the ² F _{7/2} manifolds of Yb ³⁺ @ 77K	535, 385, 163, 0	568, 407, 169, 0

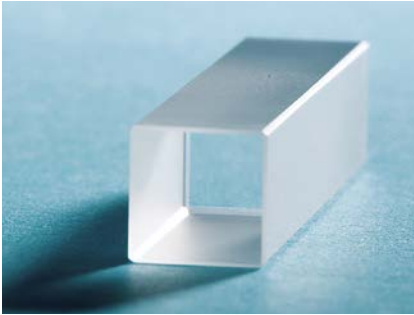


Absorption and emission spectra of Yb(5%):KYW



Absorption and emission spectra of Yb(5%):KGW

Nd:KGW – Nd-DOPED POTASSIUM GADOLINIUM TUNGSTATE



Nd:KGW crystals are low lasing threshold, highly efficient laser material exceptionally suitable for laser rangefinding applications. The efficiency of Nd:KGW lasers is 3–5 times higher than the one of Nd:YAG lasers. Nd:KGW laser medium is one of the best choices ensuring effective laser generation at low pump energies (0.5 – 1 J). These crystals supplied by EKSMA OPTICS feature high optical quality and great value of bulk resistans for laser radiation.

STANDARD SPECIFICATIONS

Orientation	[010] ± 30 min
Dopant concentration	2 – 10 at %
Diameter tolerance	+0.0 / -0.1 mm
Length tolerance	+1.0 / -0.0 mm
Chamfer	45(±10) deg × 0.2(±0.1) mm
Flatness	λ/10 @ 633 nm
Parallelism	better than 30 arcsec
Perpendicularity	better than 15 arcmin
Surface Quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Absorption losses	< 0.005 cm ⁻¹

PHYSICAL AND LASER PROPERTIES

Chemical formula	KGd(WO ₄):Nd
Lattice constants	a = 8.095 Å, b = 10 Å, c = 7.588 Å
Optical orientation	n _g = b, n _p c = 20 deg
Angle between optical axis	86.5 angular grad
Density	7.27 g/cm ³
Mohs hardness	5
Thermal conductivity	2.8 W/(m×grad) [100] 2.2 W/(m×grad) [010] 3.5 W/(m×grad) [001]
Thermal expansion	4×10 ⁻⁶ grad ⁻¹ [100] 3.6×10 ⁻⁶ grad ⁻¹ [010] 8.5×10 ⁻⁶ grad ⁻¹ [001]
Phase transition	1005 °C
Melting point	1075 °C
Transmission range	0.35–5.5 μm
Refractive index	n _g = 2.033 @ 1.067 μm n _p = 1.937 @ 1.067 μm n _m = 1.986 @ 1.067 μm
Transition	⁴ F _{3/2} → ⁴ I _{11/2}
Laser wavelength	1.0672 μm
Fluorescence lifetime	120 μs
Fluorescent width	24 cm ⁻¹
Emission cross-section	4.3×10 ⁻¹⁹ cm ⁻²
Emission temperature drift	8.5×10 ⁻⁴ nm, K ⁻¹

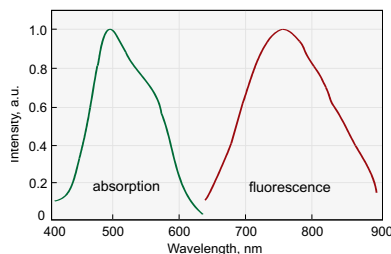
Ti:Sapphire – TITANIUM DOPED SAPPHIRE



$\text{Al}_2\text{O}_3:\text{Ti}^{3+}$ – titanium-doped sapphire crystals combine outstanding physical and optical properties with broadest lasing range.

$\text{Al}_2\text{O}_3:\text{Ti}^{3+}$ indefinitely long stability and useful lifetime added to the lasing over entire band of 660–1050 nm challenge “dirty” dyes in variety of applications. Medical laser systems, lidars, laser spectroscopy, direct femtosecond pulse generation by Kerr-type mode-locking – there are few of existing and potential applications.

The absorption band of Ti:Sapphire centered at 490 nm makes it suitable for variety of laser pump sources – argon ion, frequency doubled Nd:YAG and YLF, copper vapour lasers. Because of 3.2 μs fluorescence lifetime Ti:Sapphire crystals can be effectively pumped by short pulse flashlamps in powerful laser systems.



Ti_2O_3 wt %	a, cm^{-1} @ 490 nm	a, cm^{-1} @ 514 nm	a, cm^{-1} @ 532 nm
0.03	0.7*	0.6	0.5
0.05	1.1	0.9	0.8
0.07	1.5	1.3	1.2
0.10	2.2	1.9	1.7
0.12	2.6	2.2	2.0
0.15	3.3	2.8	2.5
0.20	4.3	3.7	3.4
0.25	5.4	4.6	4.1

* Presented values are given with $\pm 0.05 \text{ cm}^{-1}$ accuracy.

STANDARD SPECIFICATIONS

Orientation	optical axis C normal to rod axis
Ti_2O_3 concentration	0.03–0.25 wt %
Figure Of Merit	> 150 (> 300 available on special requests)
Size	up to 15 mm dia and up to 30 mm length
End configurations	flat/flat or Brewster/Brewster ends
Flatness	$\lambda/10$ @ 633 nm
Parallelism	10 arcsec
Surface Quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/4$ inch

PHYSICAL AND LASER PROPERTIES

Chemical formula	$\text{Ti}^{3+}:\text{Al}_2\text{O}_3$
Crystal structure	Hexagonal
Lattice constants	$a=4.748, c=12.957$
Density	3.98 g/cm ³
Mohs hardness	9
Thermal conductivity	0.11 cal/(°C×sec×cm)
Specific heat	0.10 cal/g
Melting point	2050 °C
Laser action	4-Level Vibronic
Fluorescence lifetime	3.2 μsec (T=300K)
Tuning range	660–1050 nm
Absorbtion range	400–600 nm
Emission peak	795 nm
Absorption peak	488 nm
Refractive index	1.76 @ 800 nm

Terahertz Crystals

GaSe / ZnTe – SEMICONDUCTOR TERAHERTZ CRYSTALS

ZnTe

ZnTe (Zinc Telluride) crystals with <110> orientation are used for THz generation by optical rectification process. Optical rectification is a difference frequency generation in media with large second order susceptibility. For femtosecond laser pulses which have large bandwidth the frequency components interact with each other and their difference produce bandwidth from 0 to several THz.

Detection of the THz pulse occurs via free-space electro-optic detection in another <110> oriented ZnTe crystal. The THz

pulse and the visible pulse are propagated collinearly through the ZnTe crystal. The THz pulse induces a birefringence in ZnTe crystal which is read out by a linearly polarized visible pulse. When both the visible pulse and the THz pulse are in the crystal at the same time, the visible polarization will be rotated by the THz pulse. Using a $\lambda/4$ waveplate and a beamsplitting polarizer together with a set of balanced photodiodes, it is possible to map THz pulse amplitude by monitoring the visible pulse polarization rotation after the ZnTe crystal at a variety of delay times with respect

to the THz pulse. The ability to read out the full electric field, both amplitude and delay, is one of the attractive features of time-domain THz spectroscopy.

ZnTe are also used for IR optical components substrates and vacuum deposition.

NOTE: ZnTe crystal contains micro bubbles and they are visible in projection of illuminated crystal. However this does not affect the THz generation. We do not accept complains on presence of bubbles in crystal.



ZnTe, <110> CUT

Size, mm	Thickness, mm	Holder, mm	Catalogue number	Price, EUR
10x10	0.1	Ø25.4	ZnTe-100H	975
10x10	0.2	Ø25.4	ZnTe-200H	775
10x10	0.5	Ø25.4	ZnTe-500H	660
10x10	1.0	Ø25.4	ZnTe-1000H	540
10x10	2.0	Ø25.4	ZnTe-2000H	825

GaSe

GaSe (Gallium Selenide) crystals used for THz generation shows a large bandwidth of up to 41 THz. GaSe is a negative uniaxial layered semiconductor with a hexagonal structure of 62 m point group and a direct bandgap of 2.2 eV at 300 K. GaSe crystal features high damage threshold, large nonlinear optical coefficient (54 pm/V), suitable transparent

range, and low absorption coefficient, which make it an alternative solution for broadband mid infrared electromagnetic waves generation. Due to broadband THz generation and detection using a sub-20 fs laser source, GaSe emitter-detector system performance is considered to achieve comparable or even better results than using thin ZnTe crystals.

In order to achieve frequency selective THz wave generation and detection system, GaSe crystals of appropriate thickness should be used.

NOTE: because of material structure it is possible to cleave GaSe crystal along (001) plane only. Another disadvantage is softness and fragility of GaSe.



GaSe crystal mounted in Ø25.4 mm holder

GaSe, Z-CUT

Clear aperture, mm	Thickness, µm	Holder, mm	Catalogue number	Price, EUR
Ø7	10	Ø25.4	GaSe-10H1	1950
Ø7	30	Ø25.4	GaSe-30H1	1625
Ø7	100	Ø25.4	GaSe-100H1	1475
Ø7	500	Ø25.4	GaSe-500H1	1460
Ø7	1000	Ø25.4	GaSe-1000H1	1635
Ø7	2000	Ø25.4	GaSe-2000H1	1810

Please note that from now all standard GaSe crystals are provided mounted into Ø25.4 mm ring holders. Crystals could be mounted into Ø40 mm holders under your request.

Raman Crystals

KGW / Ba(NO₃)₂ – CRYSTALS FOR STIMULATED RAMAN SCATTERING



EKSMA OPTICS offers crystalline materials – **Barium Nitrate – Ba(NO₃)₂** and **undoped potassium gadolinium tungstate K₂Gd(WO₄)₂** or KGW which have attracted much interest for stimulated Raman scattering (SRS). These materials can be used for frequency conversion in lasers for extending the tuning range. SRS in crystals is compatible with current all-solid-state technology and provides a very simple, compact means of frequency conversion.

Ba(NO₃)₂ has a highest Raman gain coefficient. The gain coefficient affects the threshold for Raman laser. However, the thermal lensing is particularly strong in this material. This is indicated by the large value $\partial n/\partial T$ and low thermal conductivity. Thermal effects are significantly smaller in KGW. This along with the high damage threshold make the crystal an excellent candidate for power scaling. Comparing Ba(NO₃)₂ and KGW for Raman application Ba(NO₃)₂ is more optimal in case of ns and longer pulses, KGW – in case of shorter pulses.

Ba(NO₃)₂ PHYSICAL AND OPTICAL PROPERTIES

Crystal symmetry	cubic, P2 ₁ 3
Transmission range	0.35 – 1.8 μ m
Density	3.25 g/cm ³
Hardness Mohs	2.5 – 3
Refractive indices @ 1064 nm	n = 1.555
Raman shift	1048 cm ⁻¹
Raman gain, pump 1064 nm	11 cm/GW
Thermal conductivity, W/mK	1.17
$\partial n/\partial T$	-20 $\times 10^{-6}$ K ⁻¹
Optical Damage Threshold	~ 0.4 GW/cm ²

KGW PHYSICAL AND OPTICAL PROPERTIES

Crystal symmetry	monoclinic, C2/c
Transmission range	0.35–5.5 μ m
Density	7.27 g/cm ³
Hardness Mohs	4-5
Refractive indices @ 1064 nm	$n_o = 2.061$; $n_m = 2.010$; $n_p = 1.982$
Raman shift	901 cm ⁻¹ (p[mm]p) 768 cm ⁻¹ (p[gg]p)
Raman gain, pump 1064 nm	3.3 cm/GW (901 cm ⁻¹) 4.4 cm/GW (768 cm ⁻¹)
Thermal conductivity, W/mK	$K_a=2.6$; $K_b=3.8$; $K_c=3.4$
$\partial n/\partial T$	0.4×10^{-6} K ⁻¹
Optical Damage Threshold	> 10 GW/cm ²

RAMAN WAVELENGTHS

in KGW (oscillation coefficient 901.5 cm⁻¹) and Ba(NO₃)₂ (oscillation coefficient 1048.6 cm⁻¹) crystals

Stokes	KGW pumped @ 532 nm	KGW pumped @ 1064 nm	Ba(NO ₃) ₂ pumped @ 532 nm	Ba(NO ₃) ₂ pumped @ 1064 nm	Typical efficiency, %
1 Stoke	558	1177	563	1197	35–70
2 Stoke	588	1316	598	1369	20–40
3 Stoke	621	1494	638	1599	10–15
4 Stoke	658	1726	684	1924	<10
1 Antistoke	507	970	503	957	10–30

STANDARD SPECIFICATIONS

	Ba(NO ₃) ₂	KGW
Surface Quality, scratch & dig (MIL-PRF-13830B)	40-20	10-5
Flatness @ 633 nm	$\lambda/4$	$\lambda/8$
Maximal element dimensions, mm	10 $\times$ 10 $\times$ 100	10 $\times$ 10 $\times$ 80

STANDARD KGW CRYSTALS. Updoped, b-cut

Dimensions, mm	Coating	Catalogue number	Price, EUR
7 $\times$ 7 $\times$ 30	Uncoated	KGW-701	600
5 $\times$ 7.5 $\times$ 30	BBAR/BBAR @ 400 – 700 nm	KGW-702	785

Barium & Strontium tungstate-molybdate – CRYSTALS FOR RAMAN SHIFT

- $\text{Ba}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$, $0 < x < 0.01$
- $\text{Sr}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$, $0 < x < 0.01$
- $\text{Sr}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$, $0.99 < x < 1$

New Barium and Strontium tungstate-molybdate single crystals feature higher Raman gain as compared to KGW or CaCO_3 and relatively higher thermal conductivity as compared to a $\text{Ba}(\text{NO}_2)_3$.

Barium and Strontium tungstate-molybdate single crystals are grown and provided with cut along a-direction. Active elements do not require precise positioning since stimulated Raman scattering (SRS) threshold slightly

depends on the crystal orientation relative to pump polarization (within a few percent) and minimum threshold is reached at $E||c$. In this case, the polarization of the pump and Stokes pulses are parallel to the optical axis (c-axis).

The crystals are water-insoluble and durable. Available sizes and shapes of active elements are rectangular up to $10 \times 10 \times 100$ mm or with cylindrical cross-section up to $\varnothing 10 \times 100$ mm.

APPLICATIONS

- Raman converters – new crystals extend the capabilities of the Raman devices in addition to commercially available $\text{Ba}(\text{NO}_2)_3$, CaCO_3 , KGW crystals, since new crystals have different values of the Stokes shift and allow to obtain a laser radiation at the other wavelengths
- Raman lasers including self-Raman generation
- Laser pulse compressors based on stimulated Raman scattering effect

RAMAN WAVELENGTHS GENERATION IN BARIUM TUNGSTATE, STRONTIUM TUNGSTATE AND STRONTIUM MOLYBDATE SINGLE CRYSTALS

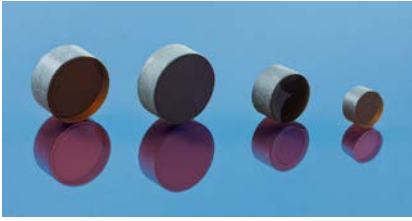
Crystal	Barium tungstate		Strontium tungstate		Strontium molybdate	
Chemical formula	$\text{Ba}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$ $0 < x < 0.01$		$\text{Sr}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$ $0 < x < 0.01$		$\text{Sr}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$ $0.99 < x < 1$	
Oscillation coefficient	925 cm^{-1}		921.5 cm^{-1}		888 cm^{-1}	
Pump	1064 nm	532 nm	1064 nm	532 nm	1064 nm	532 nm
1 Stoke	1180	560	1180	559	1175	558
2 Stoke	1325	590	1324	590	1312	588
3 Stoke	1510	624	1507	624	1485	620
4 Stoke	1755	662	1751	662	1710	656
1 Antistoke	969	507	969	507	972	508

PHYSICAL AND OPTICAL PROPERTIES

Crystal	Barium tungstate	Strontium tungstate	Strontium molybdate
Chemical formula	$\text{Ba}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$ $0 < x < 0.01$	$\text{Sr}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$ $0 < x < 0.01$	$\text{Sr}(\text{MoO}_4)_x(\text{WO}_4)_{1-x}$ $0.99 < x < 1$
Crystal structure	Tetragonal, space group $I4_1/a$	Tetragonal, space group $I4_1/a$	Tetragonal, space group $I4_1/a$
Density	6.35 g/cm^3	6.26 g/cm^3	4.65 g/cm^3
Thermal conductivity	2.3 W/m-K	3 W/m-K	4 W/m-K
Transparency range	0.45 – 5.4 μm	0.25 – 5.4 μm	0.25 – 5.4 μm
Refractive index	$n_o = 1.806$, $n_e = 1.804$ at 1064 nm $n_o = 1.848$, $n_e = 1.846$ at 532 nm	$n_o = 1.84$, $n_e = 1.85$ at 1064 nm $n_o = 1.87$, $n_e = 1.88$ at 532 nm	$n_o = 1.878$, $n_e = 1.88$ at 1064 nm $n_o = 1.919$, $n_e = 1.924$ at 532 nm
Stokes shift	925 cm^{-1}	921.5 cm^{-1}	888 cm^{-1}
Steady-state Raman gain at 1064 nm	8.5 cm/GW	5 cm/GW	5.5 cm/GW
Can be supplied Nd doped: Nd ³⁺ concentration in the crystal	0 – 0.15 at. % (on Ba site)	0 – 1.5 at. % (on Sr site)	0 – 1.5 at. % (on Sr site)
Surface optical damage threshold (1064 nm, 4.2 ns)	2 GW/cm^2	1.9 GW/cm^2	0.8 GW/cm^2
Mohs hardness	4	4	4

BaWO₄ CRYSTALS FOR RAMAN GENERATION, POLISHED, A-CUT

Dimensions, mm	Coating	Catalogue number	Price, EUR
5 × 5 × 20	Uncoated	BaWO-501	1300
5 × 5 × 30	Uncoated	BaWO-502	1700
5 × 5 × 50	Uncoated	BaWO-503	2060

Co:Spinel / Cr⁴⁺:YAG – PASSIVE Q-SWITCHING CRYSTALSCr⁴⁺:YAG crystals

Fe:ZnSe, Cr:ZnSe, Co:ZnS
solid-state saturable absorbers also are
available upon request

Co:Spinel (Co²⁺:MgAl₂O₄) is a relatively new material for passive Q-switching in lasers emitting from 1.2 to 1.6 μm, in particular, for eye-safe 1.54 μm Er:glass laser, but also works at 1.44 μm and 1.34 μm wavelengths. High absorption cross section ($3.5 \times 10^{-19} \text{ cm}^2$) permits Q-switching of Er:glass laser without intracavity focusing both with flash-lamp and diode-laser pumping. Negligible excited-state absorption results in high contrast of Q-switch, i.e. the ratio of initial (small signal) to saturated absorption is higher than 10 (Fig. 1).

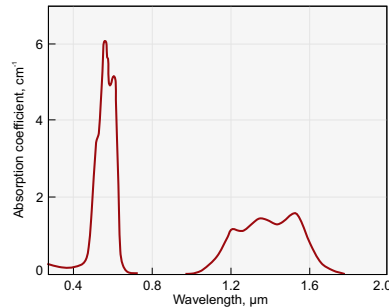


Fig. 1. Absorption spectra of the Co:Spinel crystal

Cr⁴⁺:YAG is one of the best passive Q-switch for high power lasers emitting at ~1 μm wavelength. Standard diameter apertures – 5, 8, 9.5 mm and various initial transmission (or optical density) are available upon request. Also Cr⁴⁺:YAG laser rods for ultra-short pulse solid-state lasers are available.

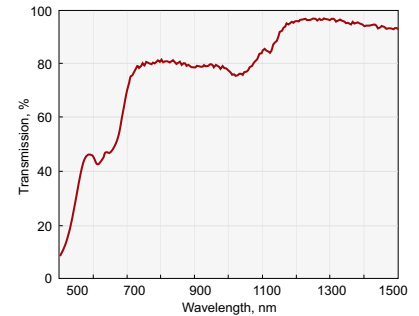


Fig. 2. Transmission of AR coated at 1064 nm Cr:YAG Q-switch with initial transmission of 80% at 1064 nm

SPECIFICATIONS

	Co:Spinel	Cr ⁴⁺ :YAG
Working wavelength range, μm	1.2 – 1.6	0.8 – 1.2
Ground state absorption cross section, cm ²	3.5×10^{-19} (at 1.54 μm)	5×10^{-18} (at 1.06 μm)
Excited state absorption cross-section, cm ²	–	7×10^{-19} (at 1.06 μm)
Initial transmittance, %	30 – 99	20 – 99
Transmission tolerances	±2 %	±2 %
Wavefront distortion	<λ/10 @ 632.8 nm	<λ/8 @ 632.8 nm
Diameter tolerances	+0.0 / -0.2 mm	+0.0 / -0.2 mm
Parallelism error	< 20 arcsec	≤ 30 arcsec
Perpendicularity	< 5 arcmin	≤ 15 arcsec
Surface quality	10 – 5 scratch & dig (per MIL-O-13830A)	20 – 10 scratch & dig (per MIL-O-13830A)
Chamfer	<0.1 mm @ 45°	<0.1 mm @ 45°
AR Coating reflectivity	<0.2 % @ 1540 nm	<0.2 % @ 1064 nm

STANDARD Cr⁴⁺:YAG CRYSTALS

Initial Transmission, %	Diameter, mm	Catalogue number	Price, EUR
20	7	CrYAG-07-20	130
30	7	CrYAG-07-30	130
35	7	CrYAG-07-35	130
40	7	CrYAG-07-40	130
45	7	CrYAG-07-45	130
50	7	CrYAG-07-50	130
65	7	CrYAG-07-65	130
70	7	CrYAG-07-70	130
80	7	CrYAG-07-80	130
85	7	CrYAG-07-85	130

STANDARD Co:Spinel CRYSTALS

Initial Transmission, %	Diameter, mm	Catalogue number	Price, EUR
30	5	CoMALO-05-30	725
40	5	CoMALO-05-40	725
50	5	CoMALO-05-50	725
60	5	CoMALO-05-60	725
70	5	CoMALO-05-70	725
80	5	CoMALO-05-80	725
90	5	CoMALO-05-90	725

Positioners & Holders

RING HOLDERS FOR NONLINEAR CRYSTALS – 830-0001



830-0001-10



830-0001-06

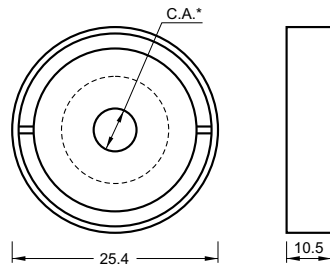
FEATURES

- › Black anodized aluminium body
- › Teflon or white anodized aluminium adapter for particular crystal size
- › Easy assembling and disassembling

Ring mounts made from black anodized aluminum and Teflon or white anodized aluminium adapter are available for safe and convenient handling of nonlinear crystals. The crystals are glued into white anodized aluminium adapter (830-0001-06). No glue is used for fixation of the crystal into open ring holder with teflon adapter. The standard sizes are Ø25.4 or Ø30 mm and thickness – 6, 10.5, 13.5 or 17.5 mm depending on crystal size.

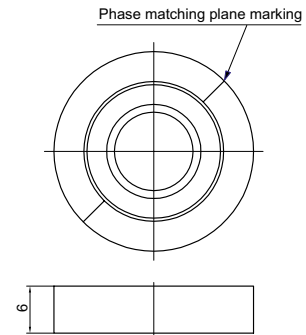
Please indicate the exact crystal size when ordering.

Diameter, mm	Thickness, mm	Max. acceptable crystal size, mm	Catalogue number	Price, EUR
25.4	6	12×12×0.5	830-0001-06	50
25.4	10.5	12×12×3	830-0001-10	50
25.4	13.5	12×12×6	830-0001-13	50
25.4	17.5	12×12×15	830-0001-17	90
30	10.5	15×15×3	830-0002-10	50
30	13.5	15×15×6	830-0002-13	50
30	17.5	15×15×15	830-0002-17	90



* C.A. - depends on crystal aperture

830-0001-10



830-0001-06

HOUSING ACCESSORIES

Positioning Mount
840-0199 for
Nonlinear
Crystal Housing
See page 2.27



NONLINEAR CRYSTALS

LASER CRYSTALS

TERAHERTZ CRYSTALS

RAMAN CRYSTALS

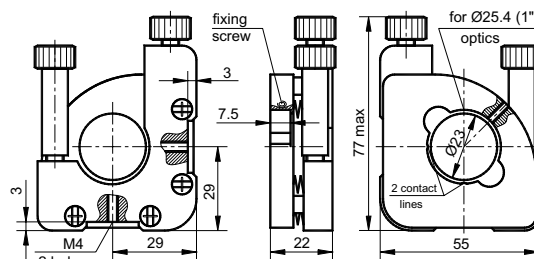
POSITIONERS & HOLDERS

CRYSTAL OVENS

KINEMATIC POSITIONING MOUNT – 840-0193

FEATURES

- › For Ø25.4 mm (1 inch) ring holders
- › Kinematic design
- › Tilt/tip range $\pm 2^\circ$
- › Sensitivity 3 arcsec
- › Both tilt and tip controlled from aside the optical path
- › Fine adjustment screws with 0.25 mm pitch
- › Hardened seats under adjustment screws



Catalogue number	Weight, kg	Price, EUR
840-0193	0.12	87

POSITIONING MOUNT FOR NONLINEAR CRYSTAL HOUSING – 840-0199

FEATURES

- › Accepts Ø25.4 mm and up to 10.5 mm thickness ring housings
- › Kinematic design
- › Wedge and ball drive mechanism
- › Tilt/tip range: $\pm 2^\circ$
- › Sensitivity: 3 arcsec
- › Fine adjustment screws with 0.25 mm pitch
- › Hardened seats under adjustment screws
- › Rotation range: 360°
- › Scale gradation: 2°
- › Compact and robust design
- › Material: black anodized aluminum



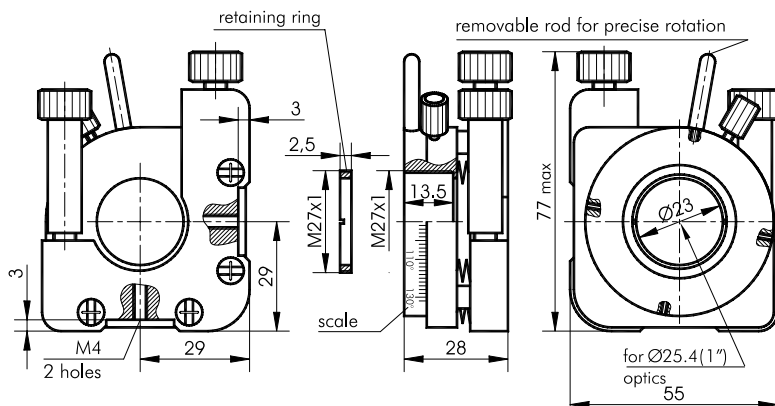
840-0199 Positioning Mount
with 830-0001 Ring Holder

This kinematic mount accepts crystal housings of Ø25.4 mm and thickness up to 10.5 mm.

Large knobs on the adjusting screws relieve the strain on operator fingers during adjustment. Both screws protrude from the top allowing convenient adjustment outside the laser beam path and providing easy access for adjustments in densely packed optical set-ups.

An extra M4 tapped hole on the side of the base allows you to operate the mount as a side-drive adjustment control mount. The mount is made of black anodized aluminium to help minimize reflections.

A retaining ring M27×1, two Teflon rings and a tightening key to fix the crystal ring housing is included.



Catalogue number	Weight, kg	Price, EUR
840-0199	0.12	165

Crystal Ovens

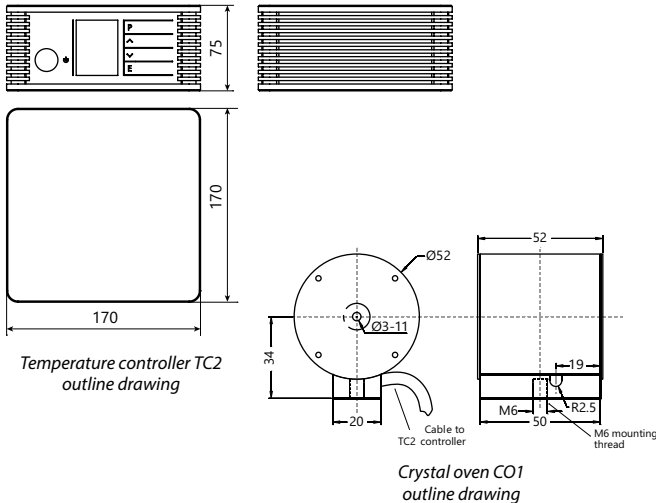
Many of widely used nonlinear crystals are susceptible to ambient humidity, for example KD*P, BBO, LBO. Protective coatings applied to the surface can reduce degradation to some extent only. To improve the protection of surfaces of the crystals from the degradation

it is desirable to keep the crystals at higher than ambient temperature, which helps avoid condensation on the crystal surfaces.

In addition, if the crystal is used for harmonics generation, the phase-matching angle depends on crystal temperature. For example,

the output power of second harmonics generator based on KD*P crystal can decrease by 50 % if the crystal temperature changes just by one degree, hence for good laser stability precise crystal temperature stabilization is necessary.

TEMPERATURE CONTROLLER TC2 WITH OVEN CO1



TC2 and CO1 is high temperature set (up to 200 °C) consisting of thermocontroller TC2 and crystal oven CO1. TC2 has two independent outputs and can control two CO1-30 ovens simultaneously. Controller is equipped by LAN and USB computer control interfaces.

The nonlinear crystal is mounted into adapter before insertion into oven CO1. Such design facilitates handling and replacement of the crystal. The nonlinear crystal can be sealed with fused silica windows in order to provide extra protection. The standard adapters are 30 and 50 mm length with apertures of 3×3, 4×4, 5×5, 6×6 mm and up to 12×12 mm size. Oven is delivered with one, customer's specific size of adapter. Adapters for different sizes can be ordered separately.

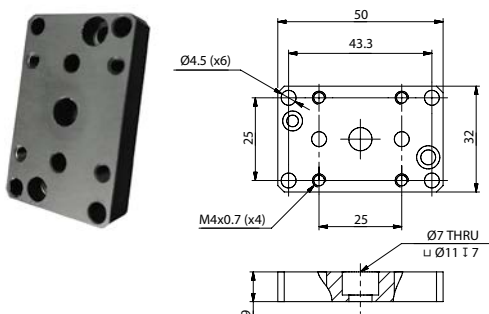
SPECIFICATIONS

Model	TC2+CO1-30	TC2+CO1-50
Quantity of ovens possible to connect to one controller TC2	2	
Temperature tuning range	RT – 200 °C	
Maximum crystals dimensions	12×12×30 mm	12×12×50 mm
Sealing (optional)	FS windows	
Temperature tuning step	0.05 °C	
Accuracy	± 0.5 °C	
Long-term stability	± 0.05 °C	
Control interfaces	LAN, USB	
Mains	90–264 V, 47–66 Hz	
Power consumption	< 50 W	
Dimensions, DiaxD	Ø52×52 mm	Ø52×72 mm

Specifications are subject to changes without advance notice.

RELATED PRODUCTS

Adapter MS-4 for CO1 mounting on tilt stage



ORDERING INFORMATION

Catalogue number **		Description, features
TC2		Temperature controller, RT-200 °C, Fuzzy logic can control two CO1 ovens, long-term stability ±0.05 °K
For crystal length up to 30 mm	For crystal length up to 50 mm	
CO1-30-y/y	CO1-50-y/y	Standard crystal sizes *
CO1-30-y/z	CO1-50-y/z	Custom crystal sizes
CO1-30S-y/y	CO1-50S-y/y	Sealed, standard crystal sizes *
MS-4		Optional adapter for CO1 oven mounting on a tilt stage. Tilt stage should be ordered separately

* Sizes 3×3, 4×4, 5×5, 6×6, 12×12 are standard.

** y/y, y/z – crystal size.

ROUND OVEN Heatpoint FOR NONLINEAR CRYSTALS



Heatpoint Crystal oven

Heatpoint is a compact round oven designed for heating of humidity sensitive nonlinear crystals. It is used to prevent moisture condensation on the crystal faces or for thermo-stabilization of the crystals.

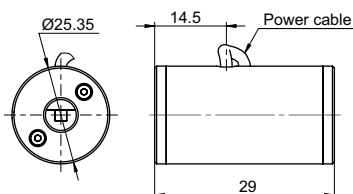
The oven features precise long term stability and compact design. Heatpoint is designed to be used with common one-inch optics positioning mounts or with our special positioning mount PM1. A small thermocontroller is attached to the oven on a wiring.

Required temperature of the oven is preset in the factory and it can be chosen by the customer in the range between 30 °C and 80 °C. Preset temperature can be adjusted in ± 5 °C range.

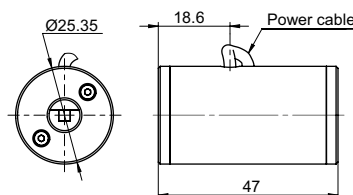
Heatpoint oven has special crystal adapter and fits crystals of size up to 6×6×30 mm. The adapter is made exactly for particular crystal size and it cannot be used for a crystal of a different size.

SPECIFICATIONS

Model	HP1	HP2
Maximum crystals dimensions	6 × 6 × 15 mm	6 × 6 × 30 mm
Preset temperature	30 – 80 °C	
Temperature tuning range near preset	± 5 °C	
Long-term stability	± 0.15 at 30-50 °C ± 0.2 at 50-80 °C	
Powering requirements	12 – 16 V	
Power consumption (PMAX)	5.5 W	
Sensor type	PTC thermo resistor	
Output connector	2.5 mm mono plug	
Thermocontroller size	18 × 12 × 42.5 mm	
Distance (wiring length) from oven to thermocontroller	180 mm	
Oven dimension, dia × L	Ø25.4 × 29 mm	Ø25.4 × 47 mm



HP1 dimensions



HP2 dimensions

MOUNT SPECIFICATIONS

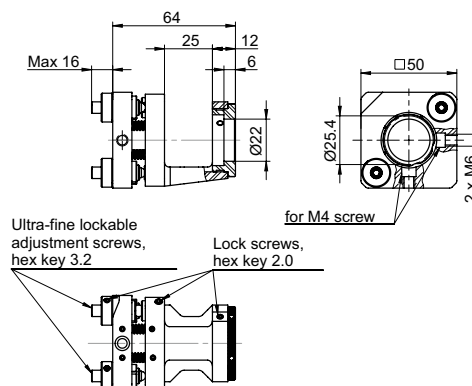
Model	PM1
Adjusting angles, tilt and tip	$\pm 3.5^\circ$
Rotation along Z-axis	180°

ORDERING INFORMATION

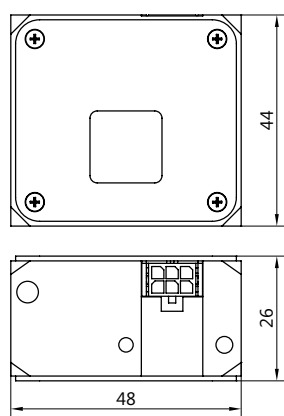
Catalogue number	Description
HP1	Heatpoint oven (Ø25.4 × 29 mm) with attached thermocontroller
HP2	Heatpoint oven (Ø25.4 × 47 mm) with attached thermocontroller
PM1	Positioning mount for Heatpoint ovens



Heatpoint Crystal oven with PM1 holder



OVEN CH8 FOR NONLINEAR CRYSTALS



CH8 dimensions

CH8 is compact oven with built-in thermocontroller for nonlinear crystals to keep them at stabilized temperature in range 30...80 °C. It is ideal for larger aperture crystals like KD*P. The crystals with up to 15 × 15 mm dimensions can be mounted. Each oven is made exactly for specific crystal aperture

size, so it cannot be used for different size crystals. CH8 crystal oven can be used with temperature preset at the factory or customer has the possibility to adjust temperature in the range 30 – 80 °C via CAN interface. Our CAN-USB converter is required in this case and it is sold separately.

SPECIFICATIONS

Model	CH8-20	CH8-30	CH8-50
Temperature range	30 – 80 °C		
Maximum crystals dimensions	15×15×20 mm	15×15×30 mm	15×15×50 mm
Temperature stability	better than ± 0.05 °C		
Power consumption	<6 W	<6 W	<9 W
Control interface	CAN		
Crystal center position above pad	16 mm		
Dimensions, W×H×D	48×44×26 mm	48×44×36 mm	48×44×56 mm

Specifications are subject to changes without advance notice.

ORDERING INFORMATION

Catalogue number **	Description, features
CH8-20 – crystal length up to 20 mm	
CH8-20-y/y	Standard crystal sizes *
CH8-20-y/z	Non-standard crystal size
CH8-30 – crystal length up to 30 mm	
CH8-30-y/y	Standard crystal sizes *
CH8-30-y/z	Non-standard crystal size
CH8-50 – crystal length up to 50 mm	
CH8-50-y/y	Standard crystal sizes *
CH8-50-y/z	Non-standard crystal size

MOUNTING ACCESSORIES

MS-1	Two axis tilt adjustment 5 degrees range, suitable for all types of CH8 crystal ovens
MS-2	Two axis tilt stage, adjustment in 5 degree range, fits two pc. of CH8 ovens

POWER SUPPLY

PS-12	Power supply for CH8 crystal oven, 100 – 240 VAC mains, +12 VDC output
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OPTIONAL EQUIPMENT

CAN-USB	CAN-USB converter for adjustment of temperature at 30 – 80 °C range
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* Sizes 3×3, 4×4, ..., 15×15 are standard.

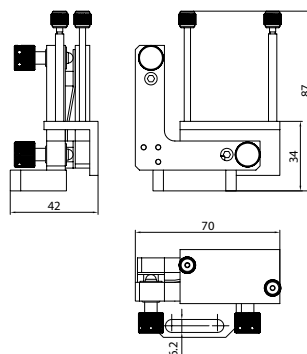
** y/y, y/z – crystal size.

RELATED PRODUCTS

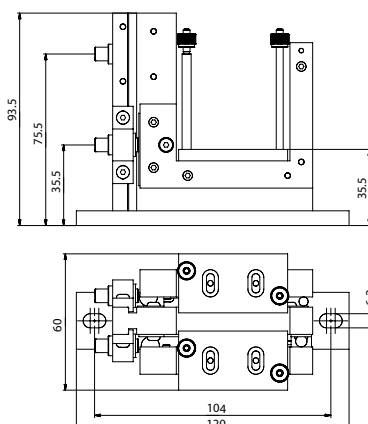
Mounts for fine tuning of CH8 crystal ovens angle. The tuning range is ± 2.5°.



Mount MS-1



Mount MS-1 outline drawing



Mount MS-2 outline drawing

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Nd:YAG LASER CRYSTALS

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OPTICAL COMPONENTS CLEANING INSTRUCTIONS

See page A.4

Nd:YAG Laser Optics

LASER MIRRORS

Our Nd:YAG laser mirrors are suitable for fundamental Nd:YAG laser 1064 nm, frequency-doubled 532 nm, frequency-tripled 355 nm and frequency quadrupled 266 nm wavelength application. Two kinds of substrate material are available. Laser line mirrors are designed for 45°

angle of incidence. Featuring high polishing quality, low scattering and high damage threshold, our dielectric reflectors enables perfect beam steering for Nd:YAG lasers.

SUBSTRATE

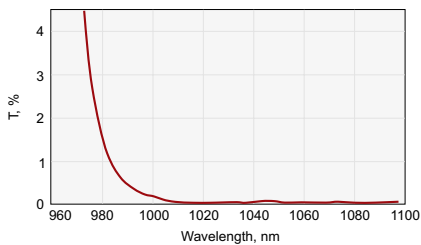
Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm -0.12 mm
Thickness Tolerance	± 0.25 mm
Wedge	< 3 min
Chamfer	0.3 mm at 45° typical

COATING

Technology	Electron beam multilayer dielectric or Ion Beam Sputtering
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Damage Threshold:	
BK7 laser line mirrors	5 J/cm ² , 8 nsec pulse, 1064 nm typical
UV FS laser line mirrors	8 J/cm ² , 8 nsec pulse, 1064 nm typical
BK7 dual line mirrors	1 J/cm ² , 8 nsec pulse, 1064 nm typical
UV FS dual line mirrors	2 J/cm ² , 8 nsec pulse, 1064 nm typical
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture
Angle of Incidence	0 or 45°

LASER LINE MIRRORS

Substrate material: **BK7 grade A**

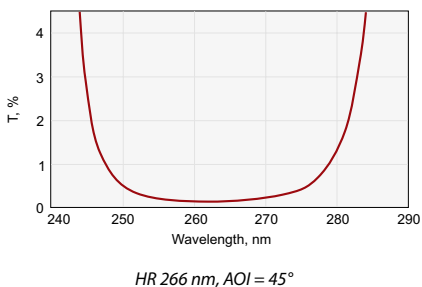


HR 1064 nm, AOI = 45°

Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
SIZE – Ø12.7 × 3 mm						
351–361	99.7	031-0350-i0	59	99.5	031-0350	59
527–532	99.7	031-0530-i0	56	99.5	031-0530	56
1047–1064	99.7	031-1060-i0	57	99.5	031-1060	57
SIZE – Ø12.7 × 6 mm						
351–361	99.7	031-0350T6-i0	59	99.5	031-0350T6	59
527–532	99.7	031-0530T6-i0	56	99.5	031-0530T6	56
1047–1064	99.7	031-1060T6-i0	57	99.5	031-1060T6	57
SIZE – Ø25.4 × 6 mm						
351–361	99.7	032-0350-i0	90	99.5	032-0350	90
527–532	99.7	032-0530-i0	74	99.5	032-0530	74
1047–1064	99.7	032-1060-i0	75	99.5	032-1060	75
SIZE – Ø50.8 × 8 mm						
351–361	99.7	035-0350-i0	128	99.5	035-0350	128
527–532	99.7	035-0530-i0	110	99.5	035-0530	110
1047–1064	99.7	035-1060-i0	110	99.5	035-1060	110
SIZE – Ø76.2 × 12.7 mm						
527–532	99.7	037-0530-i0	185	99.5	037-0530	185
1047–1064	99.7	037-1060-i0	185	99.5	037-1060	185

LASER LINE MIRRORS

Substrate material: **UV grade Fused Silica**



Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
SIZE – Ø12.7 × 3 mm						
262–266	99	041-0260-i0	71	99	041-0260	71
351–361	99.7	041-0350-i0	67	99.5	041-0350	67
527–532	99.7	041-0530-i0	62	99.5	041-0530	62
1047–1064	99.7	041-1060-i0	62	99.5	041-1060	62

SIZE – Ø12.7 × 6 mm						
262–266	99	041-0260T6-i0	71	99	041-0260T6	71
351–361	99.7	041-0350T6-i0	67	99.5	041-0350T6	67
	99.9	041-0350T6HHR-i0	110	99.9	041-0350T6HHR	110
527–532	99.7	041-0530T6-i0	62	99.5	041-0530T6	62
	99.9	041-0530T6HHR-i0	75	99.9	041-0530T6HHR	75
1047–1064	99.7	041-1060T6-i0	62	99.5	041-1060T6	62
	99.9	041-1060T6HHR-i0	75	99.9	041-1060T6HHR	75

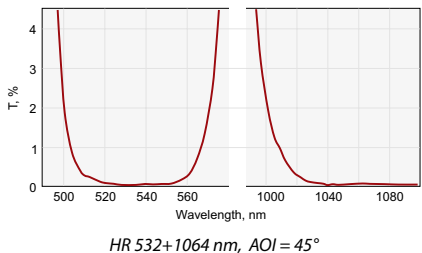
SIZE – Ø25.4 × 6 mm						
262–266	99	042-0260-i0	99	99	042-0260	99
351–361	99.7	042-0350-i0	95	99.5	042-0350	95
	99.9	042-0350HHR-i0	130	99.9	042-0350HHR	130
527–532	99.7	042-0530-i0	90	99.5	042-0530	90
	99.9	042-0530HHR-i0	105	99.9	042-0530HHR	105
1047–1064	99.7	042-1060-i0	90	99.5	042-1060	90
	99.9	042-1060HHR-i0	105	99.9	042-1060HHR	105

SIZE – Ø50.8 × 8 mm						
262–266	99	045-0260-i0	207	99	045-0260	207
351–361	99.7	045-0350-i0	187	99.5	045-0350	187
527–532	99.7	045-0530-i0	169	99.5	045-0530	169
1047–1064	99.7	045-1060-i0	169	99.5	045-1060	169

SIZE – Ø76.2 × 12.7 mm						
351–361	99.7	047-0350-i0	281	99.5	047-0350	281
527–532	99.7	047-0530-i0	258	99.5	047-0530	258
1047–1064	99.7	047-1060-i0	258	99.5	047-1060	258

DUAL BAND MIRRORS

Substrate material: **BK7 grade A**



Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
SIZE – Ø12.7 × 3 mm						
532+1064	99.7	051-5306-i0	85	99.5	051-5306	85
633+1064	99.7	051-6306-i0	85	99.5	051-6306	85

SIZE – Ø12.7 × 6 mm						
532+1064	99.7	051-5306T6-i0	85	99.5	051-5306T6	85
633+1064	99.7	051-6306T6-i0	85	99.5	051-6306T6	85

SIZE – Ø25.4 × 6 mm						
532+1064	99.7	052-5306-i0	103	99.5	052-5306	103
633+1064	99.7	052-6306-i0	103	99.5	052-6306	103

SIZE – Ø50.8 × 8 mm						
532+1064	99.7	055-5306-i0	151	99.5	055-5306	151
633+1064	99.7	055-6306-i0	151	99.5	055-6306	151

SIZE – Ø76.2 × 12.7 mm						
532+1064	99.7	057-5306-i0	227	99.5	057-5306	227
633+1064	99.7	057-6306-i0	227	99.5	057-6306	227

RELATED PRODUCTS

Prisms *See page 1.51*

Kinematic
Mirror/Beamsplitter
Mounts 840-0056

Find more at EksmaOptics.com



DUAL BAND MIRRORS

Substrate material: **UV grade Fused Silica**

Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
SIZE – Ø12.7 × 3 mm						
532+1064	99.7	061-5306-i0	109	99.5	061-5306	109
633+1064	99.7	061-6306-i0	109	99.5	061-6306	109
355+532	99.7	061-3553-i0	115	99.5	061-3553	115
SIZE – Ø12.7 × 6 mm						
532+1064	99.7	061-5306T6-i0	109	99.5	061-5306T6	109
633+1064	99.7	061-6306T6-i0	109	99.5	061-6306T6	109
355+532	99.7	061-3553T6-i0	115	99.5	061-3553T6	115
SIZE – Ø25.4 × 6 mm						
532+1064	99.7	062-5306-i0	134	99.5	062-5306	134
	99.9	062-5306HHR-i0	180	99.9	062-5306HHR	180
633+1064	99.7	062-6306-i0	134	99.5	062-6306	134
355+532	99.7	062-3553-i0	139	99.5	062-3553	139
SIZE – Ø50.8 × 8 mm						
532+1064	99.7	065-5306-i0	209	99.5	065-5306	209
633+1064	99.7	065-6306-i0	209	99.5	065-6306	209
355+532	99.7	065-3553-i0	215	99.5	065-3553	215
SIZE – Ø76.2 × 12.7 mm						
532+1064	99.7	067-5306-i0	318	99.5	067-5306	318
633+1064	99.7	067-6306-i0	318	99.5	067-6306	318
355+532	99.7	067-3553-i0	323	99.5	067-3553	323

RELATED PRODUCTS

Laser Line and Dual Laser Line Mirrors of other wavelengths

See page 1.18



Metal Coated Mirrors See page 1.26

LASER HARMONIC SEPARATORS

FEATURES

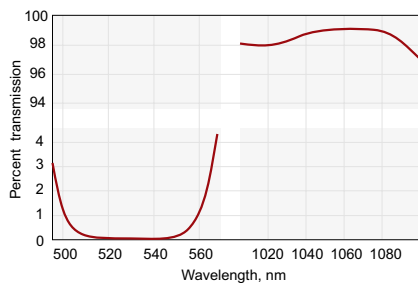
- Offered on Ø 0.5 or 1 inch substrates of BK7 or UV FS with surface flatness $\lambda/10$

Harmonic separators are dichroic beamsplitters that reflect one wavelength and transmit the others. Reflectance is higher than 99.5% for the wavelength of interest and transmittance is at least 90% for the rejected wavelengths. The rear surface of harmonic separators is antireflection coated.

SUBSTRATE

Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	$\lambda/10$ typical at 633 nm
S2 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm -0.12 mm
Thickness Tolerance	± 0.25 mm
Parallelism	< 30 arcsec
Chamfer	0.3 mm at 45° typical

LASER HARMONIC SEPARATORS WITH HIGH TRANSMISSION



041-5105HT.
 HR > 99.9% @ 532 nm,
 HT > 99% @ 1064 nm, AOI = 45°

COATING

Technology	Ion Beam Sputtering (IBS)
Damage Threshold	>10 J/cm ² , 8 nsec pulse, 1064 nm typical
Back side anti-reflection coated	AOI 45°, R<0.25% AOI 0°, R<0.2%

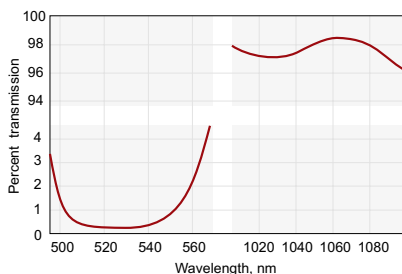
Reflected wavelength, nm R > 99.9%	Transmitted wavelength, nm R > 99%	AOI, deg	Substrate material	Ø12.7×3 mm		Ø25.4×6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
532	1064	0	UVFS	041-5100HT	160	042-5100HT	205
532	1064	45	UVFS	041-5105HT	160	042-5105HT	205
1064	532	0	UVFS	041-6500HT	165	042-6500HT	210
1064	532	45	UVFS	041-6505HT	165	042-6505HT	210

STANDARD LASER HARMONIC SEPARATORS

COATING

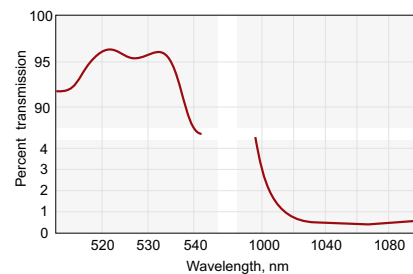
Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Damage Threshold:	
BK7	>2 J/cm ² , 8 nsec pulse, 1064 nm typical
UV FS	>5 J/cm ² , 8 nsec pulse, 1064 nm typical
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture
Back side antireflection coated	AOI 45°, R<0.5% AOI 0°, R<0.1%

Reflected wavelength, nm, R > 99.5%	Transmitted wavelength, nm	Transmission, %	AOI, deg	Substrate material	Ø12.7x3 mm		Ø25.4x6 mm	
					Catalogue number	Price, EUR	Catalogue number	Price, EUR
266	355+532+1064	>90	0	UVFS	041-2310	155	042-2310	185
266	355+532+1064	>90	45	UVFS	041-2315	155	042-2315	185
266	532	>95	0	UVFS	041-2500	135	042-2500	165
266	532	>95	45	UVFS	041-2505	135	042-2505	165
355	1064	>95	0	UVFS	041-3100	115	042-3100	145
355	1064	>95	45	UVFS	041-3105	115	042-3105	145
355	532	>95	0	UVFS	041-3500	115	042-3500	145
355	532	>95	45	UVFS	041-3505	115	042-3505	145
355	532+1064	>95	0	UVFS	041-3510	125	042-3510	155
355	532+1064	>95	45	UVFS	041-3515	125	042-3515	155
532	1064	>95	0	BK7	031-5100	90	032-5100	115
532	1064	>95	45	BK7	031-5105	90	032-5105	115
532	1064	>95	0	UVFS	041-5100	115	042-5100	145
532	1064	>95	45	UVFS	041-5105	115	042-5105	145
532+1064	355	>85	0	UVFS	041-5140	205	042-5140	230
532+1064	355	>85	45	UVFS	041-5145	205	042-5145	230
1064	532	>93	0	BK7	031-6500	95	032-6500	120
1064	532	>93	45	BK7	031-6505	95	032-6505	120
1064	532	>93	0	UVFS	041-6500	120	042-6500	150
1064	532	>93	45	UVFS	041-6505	120	042-6505	150



031-5105.

HR > 99.5% @ 532 nm, HT > 95% @ 1064 nm, AOI = 45°



031-6500.

HR > 99.5% @ 1064 nm, HT > 93% @ 532 nm, AOI = 0°

RELATED PRODUCTS

Pellin-Broca Prisms

See page 1.53

HOUSING ACCESSORIES

Adapter for Beamsplitter
at 45° 840-0116

Find more at EksmaOptics.com



Kinematic Mirror and
Beamsplitter Mount 840-0020

Find more at EksmaOptics.com



LASER OUTPUT COUPLERS

An output coupler is a partially reflecting dielectric mirror used in a laser cavity. It transmits a part of the circulating intracavity power for generating a useful output from the laser.

A low transmission output coupler leads to a low laser threshold, but also possibly to poor laser efficiency if the losses due to output coupling do not dominate over other parasitic losses in the laser cavity. The output coupler transmission is often chosen to maximize the achieved output power, although its optimum value may be lower or higher if there are other design purposes (minimizing the intracavity intensities or suppressing Q-switching instabilities in a passively mode-locked laser).

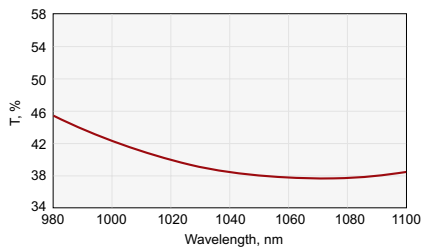
SUBSTRATE

Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	$\lambda/10$ typical at 633 nm
S2 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	± 0.25 mm
Parallelism	30 arcsec
Chamfer	0.3 mm at 45° typical

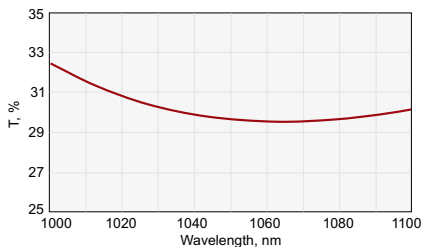
COATING

Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Damage Threshold:	
BK7	>3 J/cm ² , 8 nsec pulse, 1064 nm typical
UV FS	>6 J/cm ² , 8 nsec pulse, 1064 nm typical
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture
Angle of Incidence	0 – 8° (normal)
Back side antireflection coated	R < 0.2%

LASER OUTPUT COUPLERS



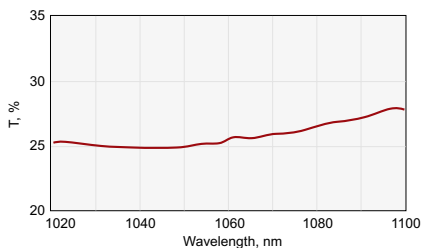
$R = 60 \pm 2\%$ @ 1064 nm, $AOI = 0^\circ$



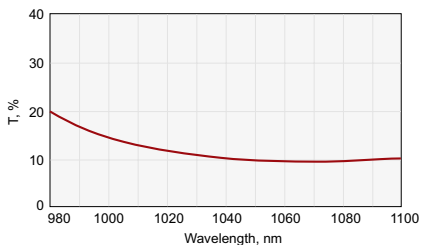
$R = 70 \pm 2\%$ @ 1064 nm, $AOI = 0^\circ$

SIZE – $\varnothing 12.7 \times 3$ mm

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Catalogue number	Price, EUR
1064	15±3	85±3	BK7	031-0015	75
1064	20±3	80±3	BK7	031-0020	75
1064	25±3	75±3	BK7	031-0025	75
1064	30±3	70±3	BK7	031-0030	75
1064	40±3	60±3	BK7	031-0040	75
1064	50±3	50±3	BK7	031-0050	75
1064	60±3	40±3	BK7	031-0060	75
1064	65±3	35±3	BK7	031-0065	75
1064	70±3	30±3	BK7	031-0070	75
1064	75±3	25±3	BK7	031-0075	75
1064	80±3	20±3	BK7	031-0080	75
1064	85±3	15±3	BK7	031-0085	75
1064	90±2	10±2	BK7	031-0090	82
1064	95±2	5±2	BK7	031-0095	82
1064	97±1	3±1	BK7	031-0097	89
1064	98±1	2±1	BK7	031-0098	89
1064	99.0±0.5	1.0±0.5	BK7	031-0099	96
1064	20±3	80±3	UV FS	041-0020	95
1064	30±3	70±3	UV FS	041-0030	95
1064	40±3	60±3	UV FS	041-0040	95
1064	50±3	50±3	UV FS	041-0050	95
1064	60±3	40±3	UV FS	041-0060	95
1064	65±3	35±3	UV FS	041-0065	95
1064	70±3	30±3	UV FS	041-0070	95
1064	75±3	25±3	UV FS	041-0075	95
1064	80±3	20±3	UV FS	041-0080	95
1064	85±3	15±3	UV FS	041-0085	95
1064	90±2	10±2	UV FS	041-0090	102
1064	95±2	5±2	UV FS	041-0095	102
1064	97±1	3±1	UV FS	041-0097	109
1064	98±1	2±1	UV FS	041-0098	109
1064	99.0±0.5	1.0±0.5	UV FS	041-0099	116



$R = 75 \pm 3\% @ 1064 \text{ nm}, AOI = 0^\circ$



$R = 90 \pm 2\% @ 1064 \text{ nm}, AOI = 0^\circ$

SIZE – Ø25.4 × 6 mm

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Catalogue number	Price, EUR
1064	15±3	85±3	BK7	032-0015	95
1064	20±3	80±3	BK7	032-0020	95
1064	25±3	75±3	BK7	032-0025	95
1064	30±3	70±3	BK7	032-0030	95
1064	40±3	60±3	BK7	032-0040	95
1064	50±3	50±3	BK7	032-0050	95
1064	60±3	40±3	BK7	032-0060	95
1064	65±3	35±3	BK7	032-0065	95
1064	70±3	30±3	BK7	032-0070	95
1064	75±3	25±3	BK7	032-0075	95
1064	80±3	20±3	BK7	032-0080	95
1064	85±3	15±3	BK7	032-0085	95
1064	90±2	10±2	BK7	032-0090	102
1064	95±2	5±2	BK7	032-0095	102
1064	97±1	3±1	BK7	032-0097	109
1064	98±1	2±1	BK7	032-0098	109
1064	99.0±0.5	1.0±0.5	BK7	032-0099	116
1064	15±3	85±3	UV FS	042-0015	115
1064	20±3	80±3	UV FS	042-0020	115
1064	25±3	75±3	UV FS	042-0025	115
1064	30±3	70±3	UV FS	042-0030	115
1064	40±3	60±3	UV FS	042-0040	115
1064	50±3	50±3	UV FS	042-0050	115
1064	60±3	40±3	UV FS	042-0060	115
1064	65±3	35±3	UV FS	042-0065	115
1064	70±3	30±3	UV FS	042-0070	115
1064	75±3	25±3	UV FS	042-0075	115
1064	80±3	20±3	UV FS	042-0080	115
1064	85±3	15±3	UV FS	042-0085	115
1064	90±2	10±2	UV FS	042-0090	122
1064	95±2	5±2	UV FS	042-0095	122
1064	97±1	3±1	UV FS	042-0097	129
1064	98±1	2±1	UV FS	042-0098	129
1064	99.0±0.5	1.0±0.5	UV FS	042-0099	136

RELATED PRODUCTS

Uncoated Flat Windows *See page 1.10*

Kinematic Mirror and
Beamsplitter Mount
840-0020

Find more at EksmaOptics.com



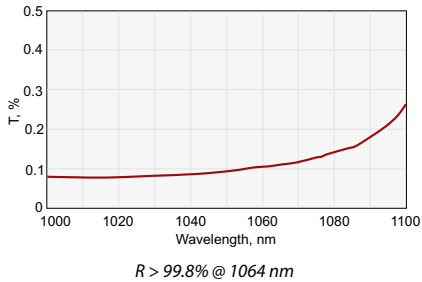
LASER REAR MIRRORS

SUBSTRATE

Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	± 0.25
Chamfer	0.3 mm at 45° typical

COATING

Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Damage Threshold:	
BK7	$>2 \text{ J/cm}^2$, 8 nsec pulse, 1064 nm
UV FS	$>5 \text{ J/cm}^2$, 8 nsec pulse, 1064 nm
Angle of Incidence	0 – 8° (normal)
Reflectivity	R > 99.7%



SIZE – Ø25.4 × 6 mm

Wavelength, nm	Substrate type	Radius, mm	Substrate material	Catalogue number	Price, EUR
1047–1064	Plano	∞	BK7	032-1060-i0	75
1064	Plano-concave	-50	BK7	032-8005	89
1064	Plano-concave	-100	BK7	032-8010	89
1064	Plano-concave	-150	BK7	032-8015	89
1064	Plano-concave	-200	BK7	032-8020	89
1064	Plano-concave	-250	BK7	032-8025	89
1064	Plano-concave	-500	BK7	032-8050	89
1064	Plano-concave	-1000	BK7	032-8100	89
1064	Plano-concave	-2000	BK7	032-8200	89
1064	Plano-concave	-2500	BK7	032-8250	89
1064	Plano-concave	-4000	BK7	032-8400	89
1064	Plano-concave	-5000	BK7	032-8500	89
1047–1064	Plano	∞	UV FS	042-1060-i0	90
1064	Plano-concave	-50	UV FS	042-8005	109
1064	Plano-concave	-100	UV FS	042-8010	109
1064	Plano-concave	-150	UV FS	042-8015	109
1064	Plano-concave	-200	UV FS	042-8020	109
1064	Plano-concave	-250	UV FS	042-8025	109
1064	Plano-concave	-500	UV FS	042-8050	109
1064	Plano-concave	-1000	UV FS	042-8100	109
1064	Plano-concave	-2000	UV FS	042-8200	109
1064	Plano-concave	-2500	UV FS	042-8250	109
1064	Plano-concave	-4000	UV FS	042-8400	109
1064	Plano-concave	-5000	UV FS	042-8500	109
1064	Plano-convex	+100	BK7	032-9010	93
1064	Plano-convex	+200	BK7	032-9020	93
1064	Plano-convex	+300	BK7	032-9030	93
1064	Plano-convex	+500	BK7	032-9050	93
1064	Plano-convex	+1000	BK7	032-9100	93
1064	Plano-convex	+2000	BK7	032-9200	93
1064	Plano-convex	+3000	BK7	032-9300	93
1064	Plano-convex	+4000	BK7	032-9400	93
1064	Plano-convex	+100	UV FS	042-9010	113
1064	Plano-convex	+200	UV FS	042-9020	113
1064	Plano-convex	+300	UV FS	042-9030	113
1064	Plano-convex	+500	UV FS	042-9050	113
1064	Plano-convex	+1000	UV FS	042-9100	113
1064	Plano-convex	+2000	UV FS	042-9200	113
1064	Plano-convex	+3000	UV FS	042-9300	113
1064	Plano-convex	+4000	UV FS	042-9400	113

RELATED PRODUCTS

Uncoated Curved Windows *See page 1.8*

Kinematic Mirror Mount 840-0010

Find more at EksmaOptics.com

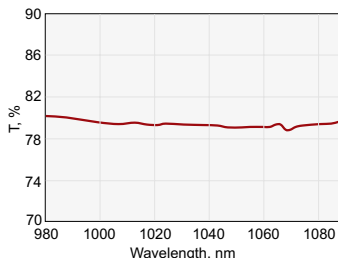


LASER BEAMSPLITTERS

FEATURES

- Designed for average polarization: $R=(R_s+R_p)/2$ and $T=(T_s+T_p)/2$

Beamsplitter splits average polarized laser beam into two beams separated by 90° from each other.



042-7120A.

$R = 20 \pm 3\%$, $T = 80 \pm 3\%$ @ 1064 nm

SUBSTRATE

Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	$\lambda/10$ typical at 633 nm
S2 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	± 0.25 mm
Parallelism	30 arcsec
Chamfer	0.3 mm at 45° typical

COATING

Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Damage Threshold:	
BK7	>5 J/cm ² , 8 nsec pulse, 1064 nm typical
UV FS	>8 J/cm ² , 8 nsec pulse, 1064 nm typical
Angle of Incidence	45±3 degrees
Back side antireflection coated	$R < 0.5\%$

DESIGNED FOR AVERAGE POLARIZATION: $R=(R_s+R_p)/2$ and $T=(T_s+T_p)/2$

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø12.7x3 mm		Ø25.4x6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	20±3	80±3	BK7	031-7120A	75	032-7120A	95
1064	30±3	70±3	BK7	031-7130A	75	032-7130A	95
1064	50±3	50±3	BK7	031-7150A	75	032-7150A	95
1064	70±3	30±3	BK7	031-7170A	75	032-7170A	95
1064	75±3	25±3	BK7	031-7175A	75	032-7175A	95
1064	80±3	20±3	BK7	031-7180A	75	032-7180A	95
1064	90±3	10±3	BK7	031-7190A	75	032-7190A	95
532	20±3	80±3	BK7	031-7220A	73	032-7220A	93
532	30±3	70±3	BK7	031-7230A	73	032-7230A	93
532	50±3	50±3	BK7	031-7250A	73	032-7250A	93
532	70±3	30±3	BK7	031-7270A	73	032-7270A	93
532	80±3	20±3	BK7	031-7280A	73	032-7280A	93
1064	20±3	80±3	UV FS	041-7120A	95	042-7120A	115
1064	30±3	70±3	UV FS	041-7130A	95	042-7130A	115
1064	50±3	50±3	UV FS	041-7150A	95	042-7150A	115
1064	70±3	30±3	UV FS	041-7170A	95	042-7170A	115
1064	75±3	25±3	UV FS	041-7175A	95	042-7175A	115
1064	80±3	20±3	UV FS	041-7180A	95	042-7180A	115
1064	90±3	10±3	UV FS	041-7190A	95	042-7190A	115
532	20±3	80±3	UV FS	041-7220A	93	042-7220A	113
532	30±3	70±3	UV FS	041-7230A	93	042-7230A	113
532	50±3	50±3	UV FS	041-7250A	93	042-7250A	113
532	70±3	30±3	UV FS	041-7270A	93	042-7270A	113
532	80±3	20±3	UV FS	041-7280A	93	042-7280A	113
355	20±3	80±3	UV FS	041-7320A	105	042-7320A	135
355	30±3	70±3	UV FS	041-7330A	105	042-7330A	135
355	50±3	50±3	UV FS	041-7350A	105	042-7350A	135
355	70±3	30±3	UV FS	041-7370A	105	042-7370A	135
355	80±3	20±3	UV FS	041-7380A	105	042-7380A	135
266	20±3	80±3	UV FS	041-7920A	115	042-7920A	145
266	30±3	70±3	UV FS	041-7930A	115	042-7930A	145
266	50±3	50±3	UV FS	041-7950A	115	042-7950A	145
266	70±3	30±3	UV FS	041-7970A	115	042-7970A	145
266	80±3	20±3	UV FS	041-7980A	115	042-7980A	145

RELATED
PRODUCTS

Uncoated
Flat Windows

See page 1.10

DESIGNED FOR S- POLARIZATION

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø12.7x3 mm		Ø25.4x6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	20±3	80±3	BK7	031-7120S	75	032-7120S	95
1064	30±3	70±3	BK7	031-7130S	75	032-7130S	95
1064	50±3	50±3	BK7	031-7150S	75	032-7150S	95
1064	70±3	30±3	BK7	031-7170S	75	032-7170S	95
1064	80±3	20±3	BK7	031-7180S	75	032-7180S	95
532	20±3	80±3	BK7	031-7220S	73	032-7220S	93
532	30±3	70±3	BK7	031-7230S	73	032-7230S	93
532	50±3	50±3	BK7	031-7250S	73	032-7250S	93
532	70±3	30±3	BK7	031-7270S	73	032-7270S	93
532	80±3	20±3	BK7	031-7280S	73	032-7280S	93
1064	20±3	80±3	UV FS	041-7120S	95	042-7120S	115
1064	30±3	70±3	UV FS	041-7130S	95	042-7130S	115
1064	50±3	50±3	UV FS	041-7150S	95	042-7150S	115
1064	70±3	30±3	UV FS	041-7170S	95	042-7170S	115
1064	80±3	20±3	UV FS	041-7180S	95	042-7180S	115
532	20±3	80±3	UV FS	041-7220S	93	042-7220S	113
532	30±3	70±3	UV FS	041-7230S	93	042-7230S	113
532	50±3	50±3	UV FS	041-7250S	93	042-7250S	113
532	70±3	30±3	UV FS	041-7270S	93	042-7270S	113
532	80±3	20±3	UV FS	041-7280S	93	042-7280S	113
355	20±3	80±3	UV FS	041-7320S	105	042-7320S	135
355	30±3	70±3	UV FS	041-7330S	105	042-7330S	135
355	50±3	50±3	UV FS	041-7350S	105	042-7350S	135
355	70±3	30±3	UV FS	041-7370S	105	042-7370S	135
355	80±3	20±3	UV FS	041-7380S	105	042-7380S	135
266	20±3	80±3	UV FS	041-7920S	115	042-7920S	145
266	30±3	70±3	UV FS	041-7930S	115	042-7930S	145
266	50±3	50±3	UV FS	041-7950S	115	042-7950S	145
266	70±3	30±3	UV FS	041-7970S	115	042-7970S	145
266	80±3	20±3	UV FS	041-7980S	115	042-7980S	145

HOUSING ACCESSORIES

Kinematic Mirror and Beamsplitter Mount
840-0030-02



Adapter for Beamsplitter at 45° 840-0116



Flipping Mirror/ Beamsplitter Mount 840-0155



Find more at EksmaOptics.com

DESIGNED FOR P- POLARIZATION

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø12.7x3 mm		Ø25.4x6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	20±3	80±3	BK7	031-7120P	75	032-7120P	95
1064	30±3	70±3	BK7	031-7130P	75	032-7130P	95
1064	50±3	50±3	BK7	031-7150P	75	032-7150P	95
1064	70±3	30±3	BK7	031-7170P	75	032-7170P	95
1064	80±3	20±3	BK7	031-7180P	75	032-7180P	95
532	20±3	80±3	BK7	031-7220P	73	032-7220P	93
532	30±3	70±3	BK7	031-7230P	73	032-7230P	93
532	50±3	50±3	BK7	031-7250P	73	032-7250P	93
532	70±3	30±3	BK7	031-7270P	73	032-7270P	93
532	80±3	20±3	BK7	031-7280P	73	032-7280P	93
1064	20±3	80±3	UV FS	041-7120P	95	042-7120P	115
1064	30±3	70±3	UV FS	041-7130P	95	042-7130P	115
1064	50±3	50±3	UV FS	041-7150P	95	042-7150P	115
1064	70±3	30±3	UV FS	041-7170P	95	042-7170P	115
1064	80±3	20±3	UV FS	041-7180P	95	042-7180P	115
532	20±3	80±3	UV FS	041-7220P	93	042-7220P	113
532	30±3	70±3	UV FS	041-7230P	93	042-7230P	113
532	50±3	50±3	UV FS	041-7250P	93	042-7250P	113
532	70±3	30±3	UV FS	041-7270P	93	042-7270P	113
532	80±3	20±3	UV FS	041-7280P	93	042-7280P	113
355	20±3	80±3	UV FS	041-7320P	105	042-7320P	135
355	30±3	70±3	UV FS	041-7330P	105	042-7330P	135
355	50±3	50±3	UV FS	041-7350P	105	042-7350P	135
355	70±3	30±3	UV FS	041-7370P	105	042-7370P	135
355	80±3	20±3	UV FS	041-7380P	105	042-7380P	135
266	20±3	80±3	UV FS	041-7920P	115	042-7920P	145
266	30±3	70±3	UV FS	041-7930P	115	042-7930P	145
266	50±3	50±3	UV FS	041-7950P	115	042-7950P	145
266	70±3	30±3	UV FS	041-7970P	115	042-7970P	145
266	80±3	20±3	UV FS	041-7980P	115	042-7980P	145

LASER LINE ANTI-REFLECTION COATED PRECISION WINDOWS

FEATURES

- Made of premium quality UV FS and BK7
- AR coated at 266 nm, 355 nm, 532 nm, 1064 nm

Precision windows are mostly used in laser systems. High quality AR multilayer coatings are applied on windows for fundamental Nd:YAG laser 1064 nm, frequency-doubled 532 nm, frequency-tripled 355 nm and

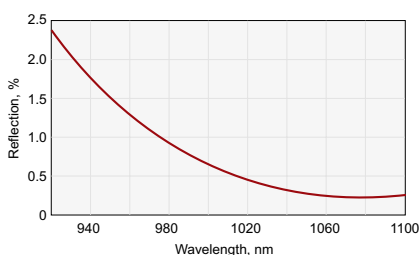
frequency-quadrupled 266 nm applications. Featuring high optical transmission with little distortion of the transmitted signal, precision windows are a good solution for applications that require protective windows.

SPECIFICATIONS

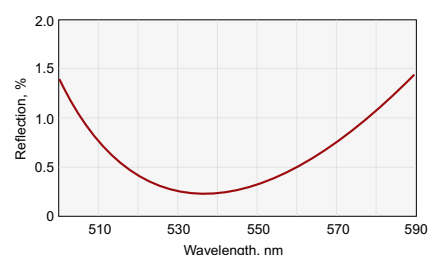
Material	BK7, UV FS
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00; -0.12 mm
Thickness tolerance	±0.2 mm
Surface flatness	$\lambda/10$ @ 633 nm
Parallelism	30 arcsec or 3 arcsec

COATING

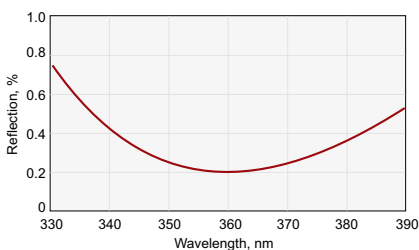
Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Damage Threshold:	
BK7	>5 J/cm ² , 8 nsec pulse, 1064 nm
UV FS	>10 J/cm ² , 8 nsec pulse, 1064 nm
Angle of Incidence	0 degrees
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture



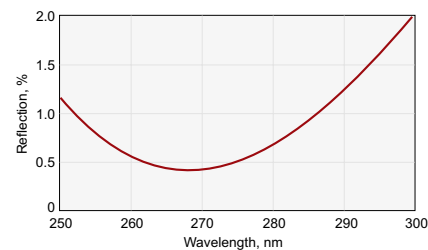
$R < 0.25\% @ 1064 \text{ nm } AOI = 0^\circ$



$R < 0.25\% @ 532 \text{ nm } AOI = 0^\circ$



$R < 0.25\% @ 355 \text{ nm, } AOI = 0^\circ$



$R < 0.4\% @ 266 \text{ nm, } AOI = 0^\circ$

PARALLELISM 30 ARCSEC

Wavelength, nm	Diameter D, mm	Thickness T, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
266	12.7	3.0	–	–	224-1101E	79
355	12.7	3.0	–	–	223-1101E	65
532	12.7	3.0	222-0101E	51	222-1101E	65
1064	12.7	3.0	221-0101E	51	221-1101E	65
266	25.4	6.0	–	–	224-1201E	85
355	25.4	6.0	–	–	223-1201E	70
532	25.4	6.0	222-0201E	61	222-1201E	70
1064	25.4	6.0	221-0201E	61	221-1201E	70
266	38.1	8.0	–	–	224-1402E	131
355	38.1	8.0	–	–	223-1402E	126
532	38.1	8.0	222-0402E	86	222-1402E	126
1064	38.1	8.0	221-0402E	86	221-1402E	126
266	50.8	10.0	–	–	224-1502E	181
355	50.8	10.0	–	–	223-1502E	176
532	50.8	10.0	222-0502E	99	222-1502E	176
1064	50.8	10.0	221-0502E	99	221-1502E	176

PARALLELISM 3 ARCSEC

Wavelength, nm	Diameter D, mm	Thickness T, mm	BK7		UV FS	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR
266	12.7	3.0	–		224-1103E	96
355	12.7	3.0	–		223-1103E	82
532	12.7	3.0	222-0103E	66	222-1103E	82
1064	12.7	3.0	221-0103E	66	221-1103E	82
266	25.4	6.0	–		224-1203E	125
355	25.4	6.0	–		223-1203E	111
532	25.4	6.0	222-0203E	88	222-1203E	111
1064	25.4	6.0	221-0203E	88	221-1203E	111
266	38.1	10.0	–		224-1403E	176
355	38.1	10.0	–		223-1403E	170
532	38.1	10.0	222-0403E	121	222-1403E	170
1064	38.1	10.0	221-0403E	121	221-1403E	170
266	50.8	12.0	–		224-1503E	217
355	50.8	12.0	–		223-1503E	212
532	50.8	12.0	222-0503E	148	222-1503E	212
1064	50.8	12.0	221-0503E	148	221-1503E	212

RELATED PRODUCTS

Uncoated Precision Windows

See page 1.12

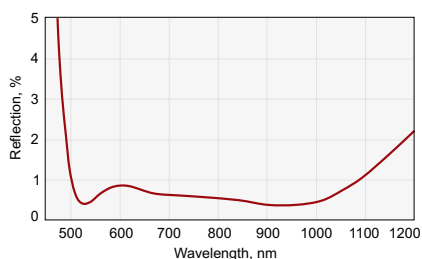
AR COATED LENS KITS



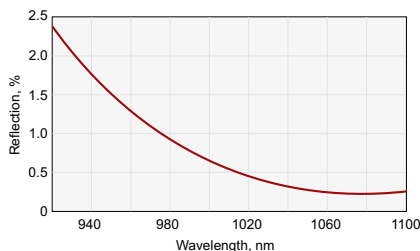
Lens kits contain different types of spherical (plano-convex, biconvex, plano-concave, biconcave) or cylindrical (plano-convex, plano-concave) lenses with various focal lengths. Kits are packed into foam lined plastic boxes for safe handling and storage. Kits are available with laser line and broadband multilayer anti-reflection coatings.

Spherical lens kits consist of 40 (large kit) or 15 (small kit) Ø25.4 mm lenses made of UVFS or N-BK7.

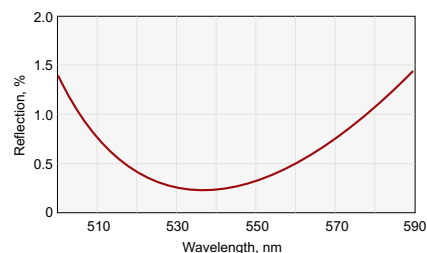
Cylindrical lens kits consist of 12 rectangular lenses (25.4 x 50.8 mm) made of UVFS or N-BK7.



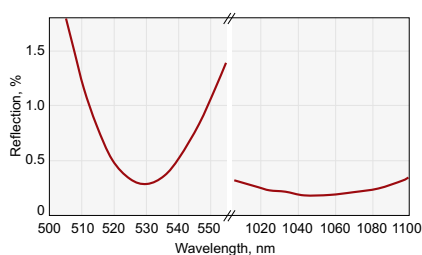
$R < 1.5\% @ 500-1100 \text{ nm}, AOI = 0^\circ$



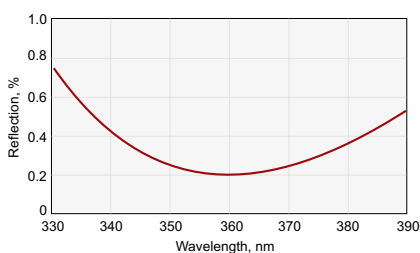
$R < 0.25\% @ 1064 \text{ nm}, AOI = 0^\circ$



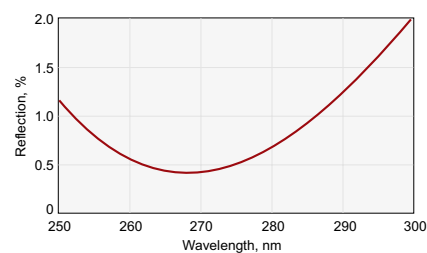
$R < 0.25\% @ 532 \text{ nm}, AOI = 0^\circ$



$R < 0.5\% @ 532 \text{ nm} + 1064 \text{ nm}, AOI = 0^\circ$



$R < 0.25\% @ 355 \text{ nm}, AOI = 0^\circ$



$R < 0.4\% @ 266 \text{ nm}, AOI = 0^\circ$

BK7 LENS KITS



Small Lenses Kit

Large N-BK7 Spherical Lens Kit (40 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 400 – 700 nm, R<0.9%	140-0240-AR400-700	1820
BBAR @ 650 – 1100, R<1.0%	140-0240-AR650-1100	1930
BBAR @ 1050 – 1700 nm, R<1.0%	140-0240-AR1050-1700	2030
AR @ 532 + 1064 nm, R<0.5%	140-0240-AR532+1064	1750
AR @ 1064 nm, R<0.25%	140-0240-AR1064	1550
AR @ 532 nm, R<0.25%	140-0240-AR532	1550

Large BK7 Lens Kit

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	30	110-0205E
pl/cx	25.4	40	110-0207E
pl/cx	25.4	50	110-0209E
pl/cx	25.4	60	110-0211E
pl/cx	25.4	75	110-0215E
pl/cx	25.4	100	110-0219E
pl/cx	25.4	125	110-0223E
pl/cx	25.4	150	110-0227E
pl/cx	25.4	200	110-0231E
pl/cx	25.4	250	110-0235E
pl/cx	25.4	300	110-0239E
pl/cx	25.4	350	110-0241E
pl/cx	25.4	400	110-0243E
pl/cx	25.4	500	110-0247E
pl/cx	25.4	700	110-0251E
pl/cx	25.4	1000	110-0259E
bi/cx	25.4	25	111-0204E
bi/cx	25.4	30	111-0206E
bi/cx	25.4	40	111-0208E
bi/cx	25.4	50	111-0210E

Type	Dia, mm	F, mm	Catalogue number
bi/cx	25.4	60	111-0214E
bi/cx	25.4	75	111-0216E
bi/cx	25.4	100	111-0218E
bi/cx	25.4	150	111-0222E
bi/cx	25.4	200	111-0226E
bi/cx	25.4	250	111-0228E
bi/cx	25.4	500	111-0234E
bi/cx	25.4	1000	111-0250E
pl/cv	25.4	-40	112-0207E
pl/cv	25.4	-50	112-0209E
pl/cv	25.4	-75	112-0215E
pl/cv	25.4	-100	112-0219E
pl/cv	25.4	-150	112-0227E
pl/cv	25.4	-200	112-0231E
bi/cv	25.4	-25	114-0204E
bi/cv	25.4	-50	114-0208E
bi/cv	25.4	-75	114-0212E
bi/cv	25.4	-100	114-0214E
bi/cv	25.4	-150	114-0220E
bi/cv	25.4	-200	114-0224E

Small N-BK7 Spherical Lens Kit (15 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 400 – 700 nm, R<0.9%	140-0215-AR400-700	990
BBAR @ 650 – 1100 nm, R<1.0%	140-0215-AR650-1100	1050
BBAR @ 1050 – 1700 nm, R<1.0%	140-0240-AR1050-1700	1150
AR @ 532 + 1064 nm, R<0.5%	140-0215-AR532+1064	770
AR @ 1064 nm, R<0.25%	140-0215-AR1064	700
AR @ 532 nm, R<0.25%	140-0215-AR532	700

Small BK7 Lens Kit

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	30	110-0205E
pl/cx	25.4	40	110-0207E
pl/cx	25.4	50	110-0209E
pl/cx	25.4	60	110-0211E
pl/cx	25.4	75	110-0215E
pl/cx	25.4	100	110-0219E
pl/cx	25.4	150	110-0227E
pl/cx	25.4	200	110-0231E

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	500	110-0247E
pl/cx	25.4	1000	110-0259E
pl/cv	25.4	-40	112-0207E
pl/cv	25.4	-50	112-0209E
pl/cv	25.4	-75	112-0215E
pl/cv	25.4	-100	112-0219E
pl/cv	25.4	-150	112-0227E

N-BK7 Cylindrical Lens Kit (12 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 400-700 nm, R<0.9%	140-0212-AR400-700	1750
BBAR @ 650-1100 nm, R<0.7%	140-0212-AR650-1100	1815
BBAR @ 1050-1700 nm, R<0.7%	140-0212-AR1050-1700	2020
AR @ 532+1064 nm, R<0.5%	140-0212-ARD1064	1620
AR @ 1064 nm, R<0.25%	140-0212-AR1064	1550

N-BK7 Cylindrical Lens Kit

Type	Size, mm	F, mm	Catalogue number
pl/cx	25.4 × 50.8	50	120-0205E
pl/cx	25.4 × 50.8	75	120-0210E
pl/cx	25.4 × 50.8	100	120-0215E
pl/cx	25.4 × 50.8	150	120-0220E
pl/cx	25.4 × 50.8	200	120-0225E
pl/cx	25.4 × 50.8	300	120-0230E

Type	Size, mm	F, mm	Catalogue number
pl/cx	25.4 × 50.8	500	120-0235E
pl/cx	25.4 × 50.8	1000	120-0240E
pl/cv	25.4 × 50.8	-50	122-0205E
pl/cv	25.4 × 50.8	-75	122-0210E
pl/cv	25.4 × 50.8	-100	122-0215E
pl/cv	25.4 × 50.8	-150	122-0220E

UV FS LENS KITS



Large Lenses Kit

Large UV FS Spherical Lens Kit (40 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 210 – 400 nm, R<2%	140-1240-AR210-400	3490
BBAR @ 350 – 900 nm, R<1.5%	140-1240-AR350-900	3290
BBAR @ 650 – 1100 nm, R<1.0%	140-1240-AR650-1100	3310
AR @ 532 + 1064 nm, R<0.5%	140-1240-AR532+1064	3130
AR @ 1064 nm, R<0.25%	140-1240-AR1064	2930
AR @ 532 nm, R<0.25%	140-1240-AR532	2930
AR @ 355 nm, R<0.25%	140-1240-AR355	3030
AR @ 266 nm, R<0.4%	140-1240-AR266	3130

Large UV FS Lens Kit

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	30	110-1203E
pl/cx	25.4	50	110-1205E
pl/cx	25.4	75	110-1209E
pl/cx	25.4	80	110-1210E
pl/cx	25.4	100	110-1211E
pl/cx	25.4	125	110-1216E
pl/cx	25.4	150	110-1217E
pl/cx	25.4	200	110-1219E
pl/cx	25.4	250	110-1221E
pl/cx	25.4	300	110-1223E
pl/cx	25.4	350	110-1225E
pl/cx	25.4	400	110-1227E
pl/cx	25.4	500	110-1233E
pl/cx	25.4	600	110-1235E
pl/cx	25.4	750	110-1239E
pl/cx	25.4	1000	110-1245E
bi/cx	25.4	25	111-1204E
bi/cx	25.4	40	111-1207E
bi/cx	25.4	50	111-1210E
bi/cx	25.4	75	111-1214E

Type	Dia, mm	F, mm	Catalogue number
bi/cx	25.4	100	111-1218E
bi/cx	25.4	150	111-1222E
bi/cx	25.4	200	111-1226E
bi/cx	25.4	250	111-1230E
bi/cx	25.4	300	111-1234E
bi/cx	25.4	400	111-1238E
bi/cx	25.4	500	111-1240E
bi/cx	25.4	1000	111-1260E
pl/cv	25.4	-50	112-1205E
pl/cv	25.4	-75	112-1209E
pl/cv	25.4	-100	112-1211E
pl/cv	25.4	-150	112-1217E
pl/cv	25.4	-200	112-1219E
pl/cv	25.4	-300	112-1223E
bi/cv	25.4	-25	114-1204E
bi/cv	25.4	-50	114-1208E
bi/cv	25.4	-75	114-1212E
bi/cv	25.4	-100	114-1216E
bi/cv	25.4	-150	114-1220E
bi/cv	25.4	-200	114-1224E

Small UV FS Spherical Lens Kit (15 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 210 – 400 nm, R<2%	140-1215-AR210-400	1830
BBAR @ 350 – 900 nm, R<1.5%	140-1215-AR350-900	1660
BBAR @ 650 – 1100 nm, R<1.0%	140-1215-AR650-1100	1670
AR @ 532 + 1064 nm, R<0.5%	140-1215-AR532+1064	1390
AR @ 1064 nm, R<0.25%	140-1215-AR1064	1320
AR @ 532 nm, R<0.25%	140-1215-AR532	1320
AR @ 355 nm, R<0.25%	140-1215-AR355	1350
AR @ 266 nm, R<0.4%	140-1215-AR266	1380

Small UV FS Lens Kit

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	30	110-1203E
pl/cx	25.4	50	110-1205E
pl/cx	25.4	75	110-1209E
pl/cx	25.4	100	110-1211E
pl/cx	25.4	125	110-1216E
pl/cx	25.4	150	110-1217E
pl/cx	25.4	200	110-1219E
pl/cx	25.4	300	110-1223E

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	500	110-1233E
pl/cx	25.4	1000	110-1245E
pl/cv	25.4	-50	112-1205E
pl/cv	25.4	-75	112-1209E
pl/cv	25.4	-100	112-1211E
pl/cv	25.4	-125	112-1215E
pl/cv	25.4	-150	112-1217E

UV FS Cylindrical Lens Kit (12 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 210-400 nm, R<2%	140-0212-ARB300	2720
BBAR @ 350-900 nm, R<1.5%	140-0212-ARB625	2630
BBAR @ 650-1100 nm, R<0.7%	140-0212-ARB825	2550

UV FS Cylindrical Lens Kit

Type	Size, mm	F, mm	Catalogue number
pl/cx	25.4 × 50.8	50	120-1205E
pl/cx	25.4 × 50.8	75	120-1210E
pl/cx	25.4 × 50.8	100	120-1215E
pl/cx	25.4 × 50.8	150	120-1220E
pl/cx	25.4 × 50.8	200	120-1225E
pl/cx	25.4 × 50.8	300	120-1230E

Type	Size, mm	F, mm	Catalogue number
pl/cx	25.4 × 50.8	500	120-1235E
pl/cx	25.4 × 50.8	1000	120-1240E
pl/cv	25.4 × 50.8	-50	122-1205E
pl/cv	25.4 × 50.8	-75	122-1210E
pl/cv	25.4 × 50.8	-100	122-1215E
pl/cv	25.4 × 50.8	-150	122-1220E

RELATED PRODUCTS

Uncoated Lens Kits
See page 1.47



Beam Expanders
See page 5.4



Self-Centring Lens
Mounts 830-0010
*Find more
at EksmaOptics.com*



Tweezers/Forceps for Optical
Components 260-1050
See page A.4



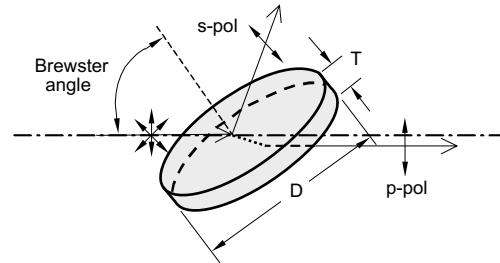
THIN FILM LASER POLARIZERS (56° ANGLE OF INCIDENCE)

Thin film polarizers separate s- and p- polarization components. Due to their high laser damage threshold, thin film polarizers can be used as an alternative to Glan-Taylor laser polarizing prisms or cube polarizing beamsplitters.

Nd:YAG Laser Line thin film polarizers are used in high energy lasers. They can be used as extracavity attenuators for Nd:YAG laser fundamental and its harmonics or intracavity Q-switch hold-off polarizers. The most efficient way to use these polarizers is at Brewster's angle – $56 \pm 2^\circ$.

SPECIFICATIONS

Material	BK7, UV FS
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	<30 arcsec
Clear aperture	>90%
Angle of incidence (AOI)	$56 \pm 2^\circ$
Diameter tolerance	+0.0; -0.12 mm
Thickness tolerance	± 0.2 mm
Laser damage threshold	6 J/cm ² 10 nsec pulse at 1064 nm typical



HIGH EXTINCTION RATIO POLARIZERS

ROUND POLARIZERS

Material – UV FS; $T_p > 98\%$, $T_s < 0.1\%$; extinction ratio for transmitted light $T_p/T_s > 1000:1$

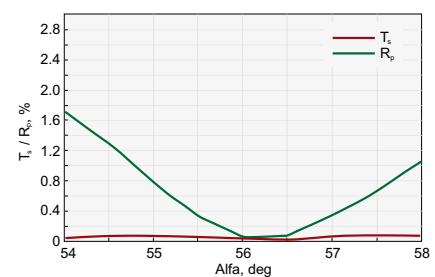
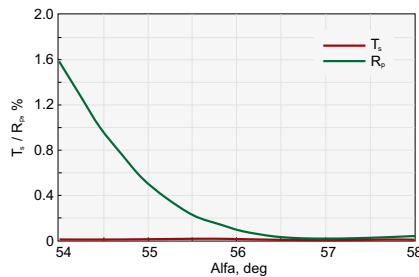
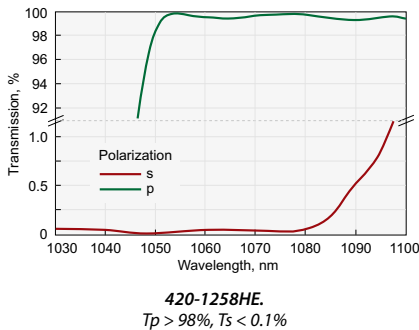
Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
355	25.4	3	420-1252HE	218
532	25.4	3	420-1254HE	185
1064	25.4	3	420-1258HE	216

RECTANGULAR POLARIZERS

Material – UV FS; $T_p > 98\%$, $T_s < 0.1\%$; extinction ratio for transmitted light $T_p/T_s > 1000:1$

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
532	20	15	6	420-1484HE	155
532	30	20	6	420-1584HE	210
1064	20	15	6	420-1488HE	165
1064	30	20	6	420-1588HE	220

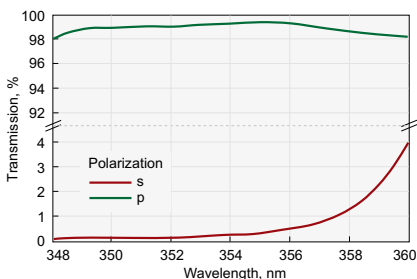
ULTRA HIGH TRANSMISSION THIN FILM POLARIZERS



ROUND POLARIZERS. Material – UV FS; $T_s < 0.2\%$, $R_p < 0.2\%$; extinction ratio for transmitted light $T_p/T_s > 500:1$

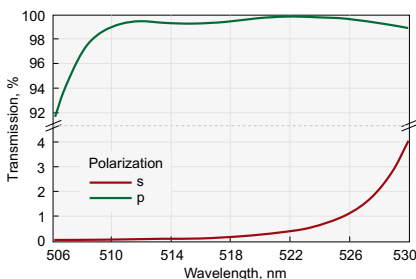
Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
532	25.4	3	420-1254UHT	260
1064	25.4	3	420-1258UHT	304

HIGH TRANSMISSION THIN FILM POLARIZERS



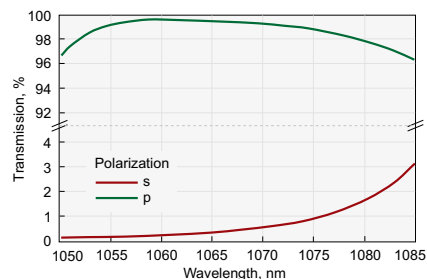
420-1252HT.

High Transmission @ 355 nm, Rs/Tp > 99.5/99.0 %



420-1254HT.

High Transmission @ 532 nm, Rs/Tp > 99.5/99.0 %



420-1258HT.

High Transmission @ 1064 nm, Rs/Tp > 99.5/99.0 %

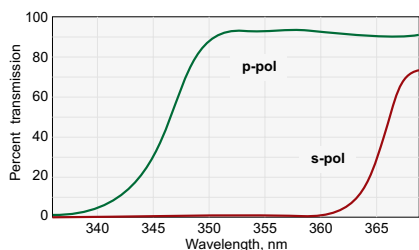
ROUND POLARIZERS. Material - UV FS. Rs / Tp > 99.5 / 99.0 %; extinction ratio for transmitted light Tp / Ts > 200:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
355	25.4	3.0	420-1252HT	237
532	25.4	3.0	420-1254HT	200
1064	25.4	3.0	420-1258HT	234

RECTANGULAR POLARIZERS. Material - UV FS. Rs / Tp > 99.5 / 99.0 %; extinction ratio for transmitted light Tp / Ts > 200:1

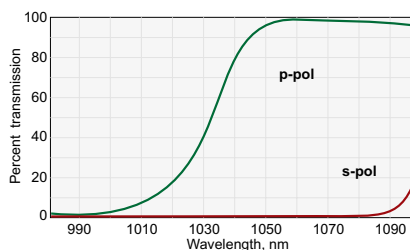
Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
1064	28.6	14.3	3.0	420-1288HT	270

STANDARD THIN FILM POLARIZERS



420-1252.

Transmission @ 355 nm, Rs/Tp > 99.5/95 %



420-1258.

Transmission @ 1064 nm, Rs/Tp > 99.5/95 %

ROUND POLARIZERS. Material – BK7; Rs / Tp > 99.5 / 95.0 %; extinction ratio for transmitted light Tp/Ts > 200:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
532	12.7	3.0	420-0124E	108
1064	12.7	3.0	420-0128E	115
532	25.4	3.0	420-0254E	128
1064	25.4	3.0	420-0258E	155
532	50.8	6.0	420-0504E	206
1064	50.8	6.0	420-0508E	255

RECTANGULAR POLARIZERS. Material – BK7; Rs / Tp > 99.5 / 95.0 %; extinction ratio for transmitted light Tp/Ts > 200:1

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
532	28.6	14.3	3.0	420-0284	142
1064	28.6	14.3	3.0	420-0288	170

ROUND POLARIZERS. Material – UV FS; Rs / Tp > 99.5 / 95.0 %; extinction ratio for transmitted light Tp/Ts > 200:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
355	12.7	3.0	420-1122E	164
532	12.7	3.0	420-1124E	131
1064	12.7	3.0	420-1128E	145
355	25.4	3.0	420-1252E	182
532	25.4	3.0	420-1254E	154
1064	25.4	3.0	420-1258E	180
355	50.8	6.0	420-1502E	325
532	50.8	6.0	420-1504E	295
1064	50.8	6.0	420-1508E	315

RECTANGULAR POLARIZERS. Material – UV FS; Rs / Tp > 99.5 / 95.0 %; extinction ratio for transmitted light Tp/Ts > 200:1

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
355	28.6	14.3	3.0	420-1282	255
532	28.6	14.3	3.0	420-1284	215
1064	28.6	14.3	3.0	420-1288	225

RELATED PRODUCTS

Thin Film Laser Polarizers of other wavelengths
See page 1.56

Glan and Wollaston Prisms
See page 1.63

Adapters for Polarizer at 56° 840-0117, 840-0118
Find more at [EksmaOptics.com](#)



Variable Attenuator for Nd:YAG linearly Polarized Laser Beam 990-0070
Find more at [EksmaOptics.com](#)

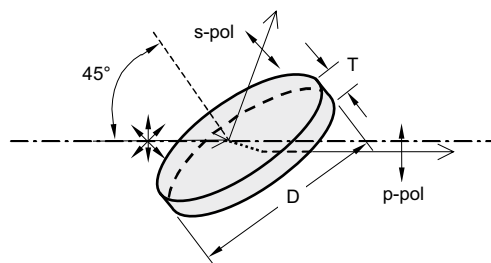


THIN FILM LASER POLARIZERS (45° ANGLE OF INCIDENCE)

These thin film polarizers separate or combine the s- and p-polarization components at 45° angle of incidence. They are designed for use in high energy lasers. Polarizers are made from UV FS and feature high laser damage threshold reaching 10 J/cm² at 1064 nm.

SPECIFICATIONS

Substrate material	UV FS
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	> 90% of diameter
Angle of Incidence (AOI)	45 ± 2°
Parallelism	< 30 arcsec



THIN FILM POLARIZERS WITH HIGH EXTINCTION RATIO

ROUND POLARIZERS

Material – UV FS. $T_p > 98\%$, $T_s < 0.1\%$; extinction ratio for transmitted light $T_p/T_s > 1000:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
355	25.4	3	420-1252i45HE	328
532	25.4	3	420-1254i45HE	295
1064	25.4	3	420-1258i45HE	315
355	50.8	6	420-1502i45HE	640
532	50.8	6	420-1504i45HE	555
1064	50.8	6	420-1508i45HE	620

STANDARD THIN FILM POLARIZERS

ROUND POLARIZERS

Material – UV FS. $R_s / T_p > 99.5 / 95.0\%$. Extinction ratio for transmitted light $T_p/T_s > 200:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
355	25.4	3	420-1252i45	238
532	25.4	3	420-1254i45	200
1064	25.4	3	420-1258i45	225
355	50.8	6	420-1502i45	455
532	50.8	6	420-1504i45	395
1064	50.8	6	420-1508i45	440

QUARTZ RETARDATION PLATES

Quartz Retardation Plates are made of material enabling linear birefringence. These plates are made of high quality optical grade crystalline quartz, featuring high damage threshold. Retardation

plates rotate polarization's direction ($\lambda/2$) or convert linear into circular polarization or vice versa ($\lambda/4$). Quartz retardation plates are supplied mounted and AR coated.

ZERO ORDER OPTICALLY CONTACTED WAVEPLATES

FEATURES

- › Zero Order Waveplates for Nd:YAG fundamental and its harmonics
- › Easily aligned
- › Temperature insensitive
- › Moderately insensitive to wavelength

Zero order plates are comprised of two different plates cut parallel to their optical axis. This construction make plates less dependent on temperature. The plates are polished to different thicknesses enabling to achieve required retardation difference. These component plates have orthogonal optic axis directions, so that the roles of the ordinary and extraordinary rays are interchanged in passing from one plate to another. The thickness of the plate determines the phase shift between the ordinary and extraordinary beams for any specific wavelength.



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm (other dimensions on request)
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Nominal thickness of waveplate	1.5 – 2.5 mm
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.4%
Damage threshold	> 0.5 J/cm ² , 10 nsec pulse, 1064 nm typical

Ø12.7 mm waveplates

Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	460-4205D12	165	460-4405D12	165
532	460-4230D12	165	460-4430D12	165
355	460-4240D12	175	460-4440D12	175
266	460-4245D12	185	460-4445D12	185

Ø20 mm waveplates

Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	460-4205	245	460-4405	245
532	460-4230	245	460-4430	245
355	460-4240	270	460-4440	270
266	460-4245	280	460-4445	280

RELATED PRODUCTS

Zero Order Optically Contacted Plates of other wavelengths. *See page 1.66*

Achromatic Air-Spaced Waveplates. *See page 1.68*

ZERO ORDER AIR-SPACED WAVEPLATES

FEATURES

- › For high power laser application



Wavelength, nm	AR coating range, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	1035–1095	464-4205	310	464-4405	310
532	515–545	464-4230	310	464-4430	310
355	345–365	464-4240	335	464-4440	335
266	257–275	464-4245	345	464-4445	345
213	210–216	464-4253	420	464-4453	420

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Damage threshold	> 10 J/cm ² , 10 nsec pulse, 1064 nm typical

RELATED PRODUCTS

Polarizer Holder 840-0180

Find more at EksmaOptics.com



LOW ORDER WAVEPLATES

FEATURES

- › Thickness 0.15–0.35 mm
- › Thinner than multiple order

Low order plates are less temperature sensitive and temperature dependent than multiple order plates. These plates are suitable for high and low power applications.

Ø12.7 mm waveplates

Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	461-4205D12	105	461-4405D12	105
532	461-4230D12	105	461-4430D12	105
355	461-4240D12	115	461-4440D12	115

Ø20 mm waveplates

Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	461-4205	160	461-4405	160
532	461-4230	160	461-4430	160
355	461-4240	192	461-4440	192

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm (other dimensions on request)
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Nominal thickness of waveplate	0.15 – 0.35 mm
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.4%
Damage threshold	10 J/cm ² , 10 nsec pulse, 1064 nm typical

RELATED PRODUCTS

Low Order
Plates of other
wavelengths

See page 1.69

High Precision
Rotation Polarizer,
Waveplate Mount
840-0186

Find more at EksmaOptics.com



MULTIPLE ORDER WAVEPLATES

FEATURES

- › Polished to 1 – 1.5 mm thickness
- › Made from a single crystalline plate

Multiple order plates are more dependent on the temperature changes than zero order plates. A change of $\pm 1\%$ from the designed wavelength of multiple order plate can result in difficulties in retardation. Contrary, with zero order plates $\pm 1\%$ and even $\pm 2\%$ change from the designed wavelength can cause only small retardation change.

Ø12.7 mm waveplates

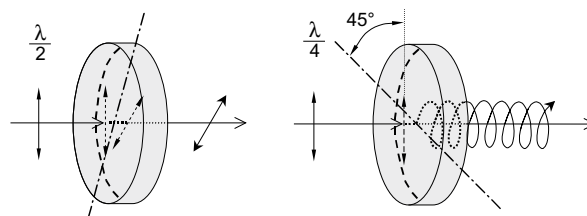
Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	462-4205D12	90	462-4405D12	90
532	462-4230D12	90	462-4430D12	90
355	462-4240D12	95	462-4440D12	95

Ø20 mm waveplates

Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1064	462-4205	138	462-4405	138
532	462-4230	138	462-4430	138
355	462-4240	143	462-4440	143
266	462-4245	153	462-4445	153



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm (other dimensions on request)
Ring mount outer diameter	25.4 +0.0 / -0.2 mm
Nominal thickness of waveplate	0.8 – 1.5 mm
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.4%
Damage threshold	10 J/cm ² , 10 nsec pulse, 1064 nm typical

RELATED PRODUCTS

Multiple Order Plates
of other wavelengths

See page 1.70

Adjustable Polarizer
Holder of Side
Drive 840-0195

Find more at EksmaOptics.com



MULTIPLE ORDER DUAL WAVELENGTH WAVEPLATES

FEATURES

- › Operate at both first and second Nd:YAG laser harmonics
- › Retardation tolerance $< \lambda/300$

Retardation and Wavelength	Catalogue number	Price, EUR
λ @ 1064 nm + $\lambda/2$ @ 532 nm	463-4120	215
λ @ 1064 nm + $\lambda/4$ @ 532 nm	463-4140	215
$\lambda/2$ @ 1064 nm + λ @ 532 nm	463-4210	215
$\lambda/2$ @ 1064 nm + $\lambda/2$ @ 532 nm	463-4220	215
$\lambda/2$ @ 1064 nm + $\lambda/4$ @ 532 nm	463-4240	215
$\lambda/4$ @ 1064 nm + λ @ 532 nm	463-4410	215
$\lambda/4$ @ 1064 nm + $\lambda/2$ @ 532 nm	463-4420	215
$\lambda/4$ @ 1064 nm + $\lambda/4$ @ 532 nm	463-4440	215

SPECIFICATIONS

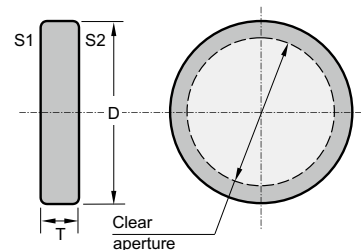
Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.2 mm
Nominal thickness of waveplate	0.2 – 1.2 mm
Surface quality	20–10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	$R < 0.5\%$
Damage threshold	5 J/cm ² , 10 nsec pulse, 1064 nm typical

POLARIZATION PLANE ROTATORS

FEATURES

- › Made of crystalline quartz
- › Intended to rotate a beam polarization plane strictly to an appropriate angle using the circular birefringent effect

Compared to a waveplate, a rotator has an intrinsic advantage, being independent of rotation around its own optical axis. It needs no adjustment, only to be installed normal to incident radiation. A polarization plane rotator is normally used for the specific wavelength. It is only slightly dependent on ambient temperature.



Polarization plane rotators for any wavelength from 200 to 2300 nm are available.

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	Normal to faces S1, S2 of rotator
Clear aperture	17 mm for 20 mm diameter
Ring mount outer diameter	$D = 25.4 +0.0 / -0.2$ mm
Mount Thickness	$T = 6 - 20$ mm (depending on wavelength and rotation angle)
Surface quality	20-10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$
Parallelism	< 10 arcsec
AR coating	$R < 0.2\%$ both sides
Damage threshold	5 J/cm ² , 10 nsec pulse, 1064 nm typical

RELATED PRODUCTS

Polarization plane rotators of other wavelengths

See page 1.72

Kinematic Mirror and Beamsplitter Mount 840-0020

Find more at EksmaOptics.com



Kinematic Positioning Mount 840-0193

Find more at EksmaOptics.com



Wavelength, nm	Rotation angle of polarization plane, deg	Catalogue number	Price, EUR
266	45	470-4264	245
266	90	470-4269	245
355	45	470-4354	195
355	90	470-4359	195
532	45	470-4534	195
532	90	470-4539	195
1064	45	470-4644	215
1064	90	470-4649	215

Please contact us for other size or wavelengths requirements.

VARIABLE ATTENUATOR FOR Nd:YAG LINEARLY POLARIZED LASER BEAM 990-0070

FEATURES

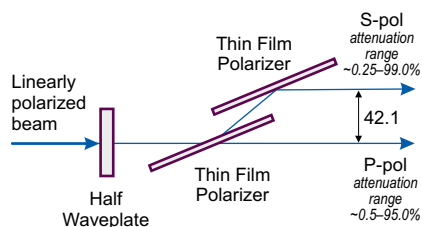
- › Divides laser beam into two parallel beams of manually adjustable intensity ratio
- › Large dynamic range
- › Transmitted beam shift ~0.5 mm
- › High Optical damage threshold



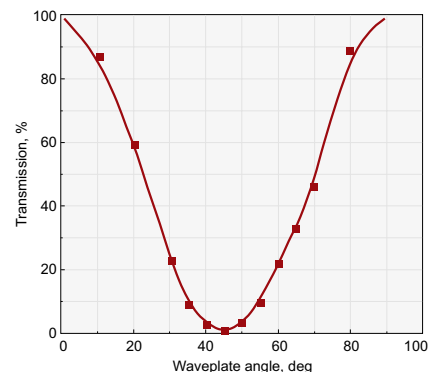
Note: Movable base 820-0090, Rod Holder 820-0050-02 and standard rod should be ordered separately.

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 reflect s-polarized light while transmitting p-polarized light, are housed into adapter. A quartz multiple order half waveplate is 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.



SPECIFICATIONS

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

Wavelength, nm	Catalogue number	Price, EUR
266	990-0070-266H *	1020
355	990-0070-355	750
532	990-0070-532	650
1064	990-0070-1064	650

* With Zero Order Air-Spaced half waveplate.

RELATED PRODUCTS

Neutral Density Filters

See page 1.14

Thin Film Laser Polarizers for Nd:YAG applications

See page 3.16

Motorized Variable Attenuator for Linearly Polarized Laser Beam 990-0070M

See page 5.15



Beam dumps 990-0800, 990-0820

See page 5.22



VARIABLE ATTENUATOR FOR Nd:YAG LINEARLY POLARIZED LASER BEAM 990-0071

FEATURES

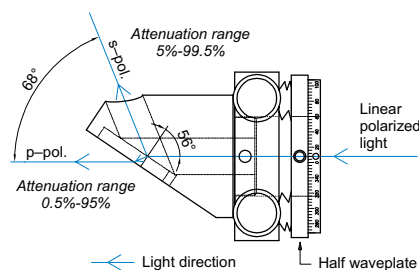
- › Divides laser beam into separated by 68° angle two beams of manually adjustable intensity ratio
- › Large dynamic range
- › Transmitted beam shift ~0.5 mm
- › High Optical damage threshold



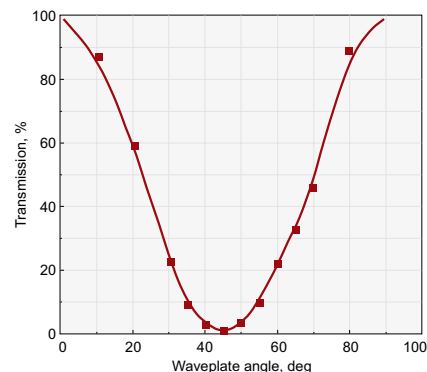
Note: Solid Base Height Extender **820-0210** and Standard Rod **820-0020-20** should be ordered separately

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 reflect s-polarized light at 56° while transmitting p-polarized light, is housed into adapter for polarizer at 56°. Quartz multiple order half waveplate is 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.



SPECIFICATIONS

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

Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266H *	690
355	990-0071-355	475
532	990-0071-532	445
1064	990-0071-1064	445

* With Zero Order Air-Spaced half waveplate.

RELATED PRODUCTS

Motorized Variable Attenuator for Linearly Polarized Laser Beam
990-0071M
See page 5.18



Multiple Order Plates for Nd:YAG applications
See page 3.20

Thin Film Laser Polarizers for Nd:YAG applications
See page 3.16

VARIABLE ATTENUATOR FOR Nd:YAG LASER PULSES 990-0072

FEATURES

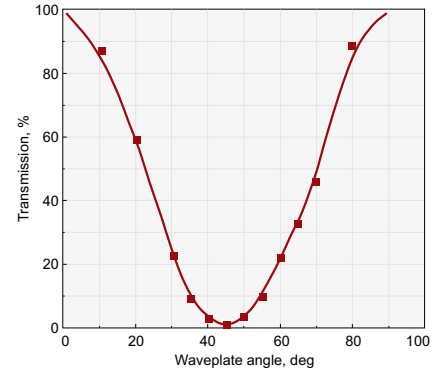
- › Divides laser beam into two beams of manually adjustable intensity ratio separated by 68° angle
- › Large dynamic range
- › Transmitted beam shift ~1 mm
- › High optical damage threshold
- › Motorized version 990-0072M available online



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 reflect s-polarized light while transmitting p-polarized light, is housed into Beamsplitter Mount 840-0056-12. A quartz Multi Order Half Waveplate diameter 25.4 mm housed in rotating holder 840-0190-01 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.

The holder 840-0056-12 allows to adjust Angle Of Incidence of the Thin Film Brewster type polarizers by $\pm 4.5^\circ$ and to get the maximum extinction contrast. The mounts are on rods, rod holders and Movable Base 820-0090. The optical axis height from the table top can be adjusted in the range 78-88 mm. Other height can be offered as custom changing the standard rods and rod holders into higher.

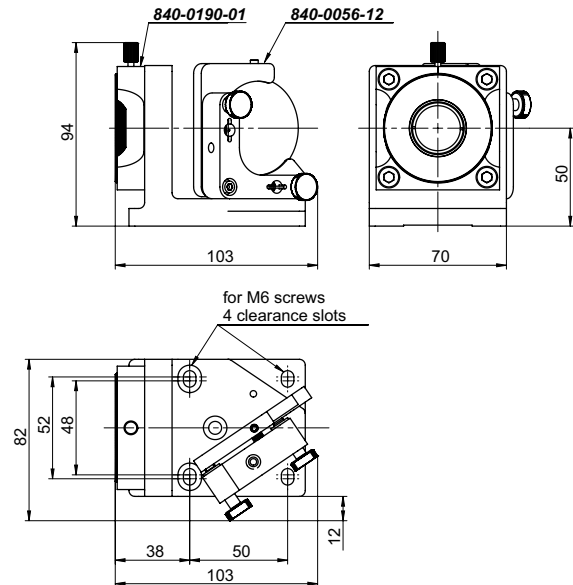


SPECIFICATIONS

Clear Aperture diameter	22 mm
Damage threshold	>5 J/cm ² , 10 ns pulse, 10 Hz at 1064 nm, typical
Polarization Contrast	>1:200
Transmitted beam shift	~1 mm
Weight	0.45 kg

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266H *	1085
355	990-0072-355	765
532	990-0072-532	735
1064	990-0072-1064	755

* With Zero Order Air-Spaced half waveplate.



VARIABLE ATTENUATOR FOR Nd:YAG LASER PULSES 990-0073

FEATURES

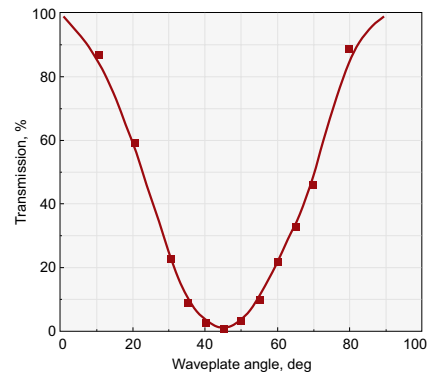
- › Divides laser beam into two beams of manually adjustable intensity ratio separated by 68° angle
- › Large dynamic range
- › Transmitted beam shift ~1.4 mm
- › High optical damage threshold



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 reflect s-polarized light while transmitting p-polarized light, is housed into Beamsplitter Mount 840-0056-13. A quartz Multi Order Half Waveplate Ø40 mm housed in rotating 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.

The holder 840-0056-13 allows to adjust Angle Of Incidence of the Thin Film Brewster type polarizers by $\pm 4.5^\circ$ and to get the maximum extinction contrast. The mounts are on rods, rod holders and Movable Base 820-0090. The optical axis height from the table top can be adjusted in the range 92-98 mm. Other height can be offered as custom changing the standard rods and rod holders into higher.

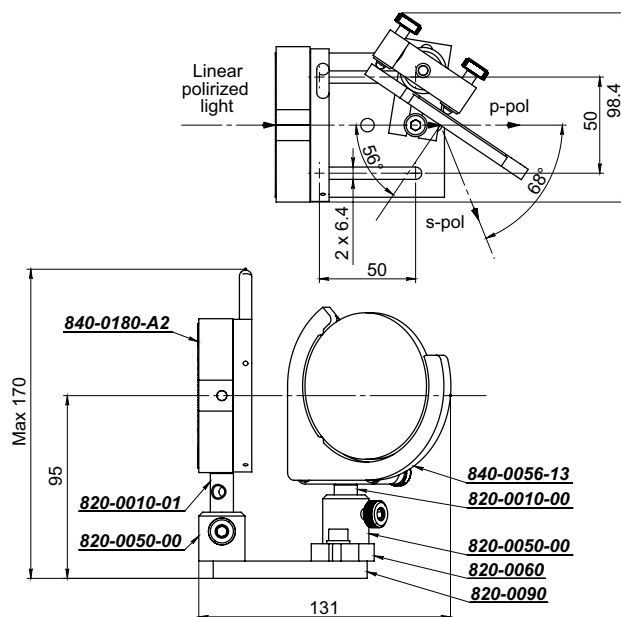


SPECIFICATIONS

Clear Aperture diameter	36 mm
Damage threshold	>5 J/cm ² , 10 ns pulse, 10 Hz at 1064 nm, typical
Polarization Contrast	>1:200
Transmitted beam shift	~1.4 mm
Weight	0.6 kg

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266H *	1790
355	990-0073-355	1460
532	990-0073-532	1440
1064	990-0073-1064	1515

* With Zero Order Air-Spaced half waveplate.



Nd:YAG Laser Crystals

Nd:YAG CRYSTALS (STANDARD RODS)



SPECIFICATIONS OF STANDARD Nd:YAG LASER RODS

Nd Doping Level	0.8% or 1.1%
Orientation	<111> crystalline direction
Surface Quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Surface Flatness	$\lambda/10$ at 633 nm
Parallelism	< 10 arcsec
Perpendicularity	< 5 arcmin for plano/plano ends
Diameter Tolerance	+0 / -0.05 mm
Length Tolerance	+1 / -0.5 mm
Clear Aperture	> 90 % of full aperture
Chamfers	0.1 mm at 45 deg
Coating	Both sides coated AR @ 1064 nm, R < 0.2%, AOI = 0 deg
Barrel Grooving	All Ø6.35, 8, 10, 12 mm rods with barrel grooving

Diameter, mm	Length, mm	Doping, %	Wedge of the ends, deg	Description	Coating	Application	Catalogue number	Price, EUR
3	53	0.9	0/0	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-3-0.9-A/A	215
3	65	0.8	0/0	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-3-0.8-A/A	265
3	65	1.1	0/0	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-3-1.1-A/A	325
4	65	0.8	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-4-0.8-A/A	530
4	65	1.1	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-4-1.1-A/A	530
6.35	85*	1.1	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-6.35-1.1-A/A	890
8	85*	1.1	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-8-1.1-A/A	1340
10	85*	1.1	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-10-1.1-A/A	2200
12	100*	0.8	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-12-0.8-A/A	4740
12	100*	1.1	3/3 parallel	Nd:YAG	AR/AR @ 1064 nm	Generation @ 1064 nm	E-Y-12-1.1-A/A	4740

* Rods with barrel grooving, except 10 mm at both ends of the rod without grooving.

RELATED PRODUCTS

Laser Safety Eyewear

See page 1.17



Visualizator 990-0840

See page 1.17



Pockels Cells for Q-Switching

Find more at
[EksmaOptics.com](#)



NONLINEAR CRYSTALS for SHG @ 1064 nm

LBO CRYSTALS

LBO crystals feature the highest damage threshold, small walk-off and have high efficiency. These crystals are the best choice for harmonics generation of relatively high power and high repetition rate Q-switched or mode-locked lasers.

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
3x3x10	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-401	245
3x3x15	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-402	325
4x4x10	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-301	510
4x4x15	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-302	630
4x4x20	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-303	745
5x5x10	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-501	655
5x5x15	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-503	765
5x5x20	90	11.6	Type 1	AR/AR @ 1064+532 nm	SHG@1064 nm	LBO-502	940
3x3x15	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-404	325
3x3x20	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-405	405
3x3x30	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-409	710
3x3x50	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-410	1300
4x4x10	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-304	510
4x4x15	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-305	630
4x4x20	90	0	Type 1	AR/AR @ 1064+532 nm	NCPM SHG@1064 nm, T=149 °C	LBO-306	745

KTP CRYSTALS

KTP crystals feature the highest efficiency and are suited for low average power or CW lasers applications. These crystals are temperature change insensitive and operate with sharply focused or highly divergent laser beams.

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
3x3x5	90	23.5	Type 2	AR/AR @ 1064+532 nm	SHG@1064 nm	KTP-401	76
3x3x10	90	23.5	Type 2	AR/AR @ 1064+532 nm	SHG@1064 nm	KTP-402	109
4x4x6	90	23.5	Type 2	AR/AR @ 1064+532 nm	SHG@1064 nm	KTP-403	118
7x7x9	90	23.5	Type 2	AR/AR @ 1064+532 nm	SHG@1064 nm	KTP-404	529

DKDP CRYSTALS

Large aperture DKDP crystals are used for high energy Q-switched lasers with large beam diameters.

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
15x15x13	36.5	45	Type 1	AR/AR @ 1064/1064+532 nm	SHG@1064 nm	DKDP-401	485
15x15x13	53.5	0	Type 2	AR/AR @ 1064/1064+532 nm	SHG@1064 nm	DKDP-402	485
12x12x20	53.5	0	Type 2	AR/AR @ 1064/1064+532 nm	SHG@1064 nm	DKDP-404	475
15x15x20	53.5	0	Type 2	AR/AR @ 1064/1064+532 nm	SHG@1064 nm	DKDP-405	579

Please contact EKSMA OPTICS
for special OEM and large volume pricing.

RELATED PRODUCTS

Ovens with thermocontrollers and
heaters for different crystal sizes

See pages 2.28–2.30



NONLINEAR CRYSTALS for THG @ 1064 nm

LBO CRYSTALS

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
3x3x10	42.2	90	Type 2	AR/AR @ 1064+532/355 nm	THG@1064 nm	LBO-406	245
3x3x15	42.2	90	Type 2	AR/AR @ 1064+532/355 nm	THG@1064 nm	LBO-407	325
5x5x15	42.2	90	Type 2	AR/AR @ 1064+532/355 nm	THG@1064 nm	LBO-508	765

DKDP CRYSTALS

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
12x12x20	59.3	0	Type 2	AR/AR @ 1064+532/355 nm	THG@1064 nm	DKDP-403	475
15x15x20	59.3	0	Type 2	AR/AR @ 1064+532/355 nm	THG@1064 nm	DKDP-406	579

NONLINEAR CRYSTALS for 4HG @ 1064 nm

BBO CRYSTALS

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
7x7x6	47.6	90	Type 1	P/P @ 532/266 nm	SHG@532 nm	BBO-700	925

KDP CRYSTALS

Size, mm	Orientation		Type	Coating	Application	Catalogue number	Price, EUR
	Theta, deg	Phi, deg					
12x12x5	76.5	45	Type 1	AR/AR @ 532/266 nm	SHG@532 nm	KDP-401	408
15x15x7	76.5	45	Type 1	AR/AR @ 532/266 nm	SHG@532 nm	KDP-402	480

HOUSING ACCESSORIES

Ring Holders
for Nonlinear Crystals
See page 2.26



Positioning Mount
840-0199 for
Nonlinear Crystal
Housing
See page 2.27



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OPTICAL COMPONENTS CLEANING INSTRUCTIONS

See page A.4

FemtoLine Laser Optics

LASER MIRRORS

Laser mirrors for femtosecond applications are designed to have a broad operating wavelength range and linear phase versus frequency characteristics (group delay dispersion (GDD)). The coating is a single layer dielectric and has no phase shift over the operating wavelength region. High reflectivity mirrors always have higher reflection, broader operating region and lower pulse distortion for s-polarization than for

p-polarization for the same dielectric coating. If possible use the mirrors with s-polarized beam.

Our standard mirrors are suitable for fundamental Ti:Sapphire and Yb:KGW or KYW lasers and their doubled, tripled or quadrupled frequencies.

SUBSTRATE

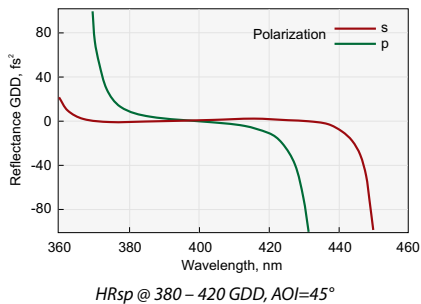
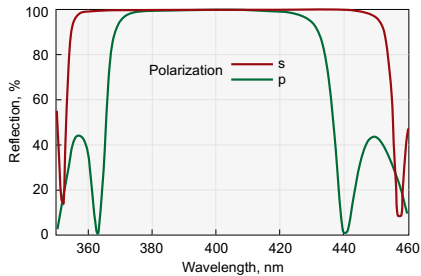
Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm -0.12 mm
Thickness Tolerance	± 0.25 mm
Wedge	< 3 min
Chamfer	0.3 mm at 45° typical

COATING

Technology	Electron beam multilayer dielectric or Ion beam sputtering
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Coating	Hard dielectric High Reflection R>99.5%
Angle of Incidence	0 or $45 \pm 3^\circ$
Designed for average polarization	$R = (R_s + R_p)/2$
Laser Damage Threshold	>100 mJ/cm ² , 50 fsec pulse, 50 Hz, 800 nm typical
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture

LOW GDD ULTRAFAST MIRRORS

Substrate material: **BK7 grade A**



Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
Size – Ø12.7 × 3 mm						
380 – 420	99.7	031-0400-i0	57	99.5	031-0400	57
500 – 530	99.7	031-0515-i0	56	99.5	031-0515	56
760 – 840	99.7	031-0800-i0	61	99.5	031-0800	61
1000 – 1060	99.7	031-1030-i0	57	99.5	031-1030	57

Size – Ø12.7 × 6 mm						
380 – 420	99.7	031-0400T6-i0	57	99.5	031-0400T6	57
500 – 530	99.7	031-0515T6-i0	56	99.5	031-0515T6	56
760 – 840	99.7	031-0800T6-i0	61	99.5	031-0800T6	61
1000 – 1060	99.7	031-1030T6-i0	57	99.5	031-1030T6	57

Size – Ø25.4 × 6 mm						
380 – 420	99.7	032-0400-i0	89	99.5	032-0400	89
500 – 530	99.7	032-0515-i0	74	99.5	032-0515	74
760 – 840	99.7	032-0800-i0	85	99.5	032-0800	85
1000 – 1060	99.7	032-1030-i0	75	99.5	032-1030	75

Size – Ø50.8 × 8 mm						
380 – 420	99.7	035-0400-i0	133	99.5	035-0400	133
500 – 530	99.7	035-0515-i0	110	99.5	035-0515	110
760 – 840	99.7	035-0800-i0	133	99.5	035-0800	133
1000 – 1060	99.7	035-1030-i0	110	99.5	035-1030	110

Size – Ø76.2 × 12.7 mm						
380 – 420	99.7	037-0400-i0	199	99.5	037-0400	199
500 – 530	99.7	037-0515-i0	185	99.5	037-0515	185
760 – 840	99.7	037-0800-i0	199	99.5	037-0800	199
1000 – 1060	99.7	037-1030-i0	185	99.5	037-1030	185

RELATED PRODUCTS

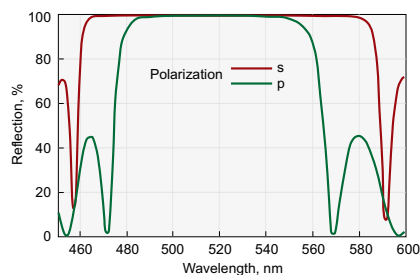
Adapter for Mirror at 45° 840-0115

Find more at EksmaOptics.com

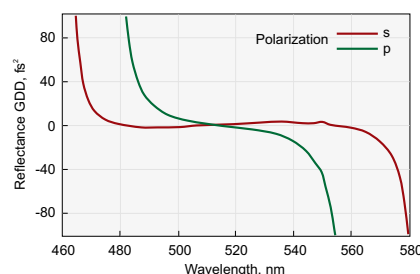
LOW GDD ULTRAFAST MIRRORS

Substrate material: **UV grade Fused Silica**

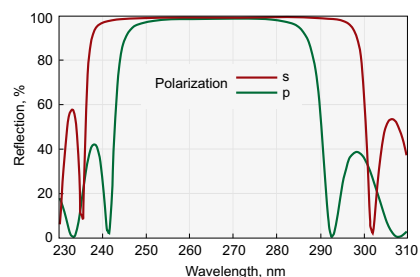
Recommended for high power laser applications operating in UV region.



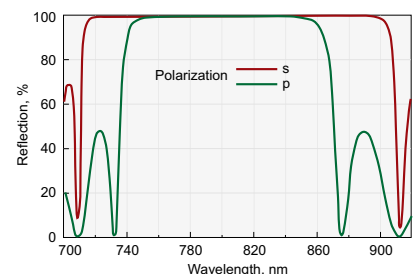
HR>99.5% @ 500-530 nm, AOI=45°



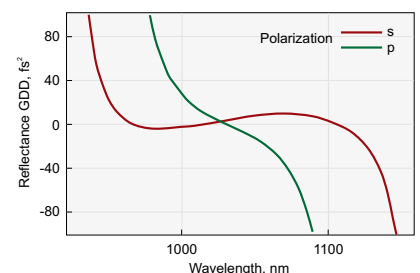
HRsp @ 500-530 GDD, AOI=45°



HR>99% @ 257-275 nm, AOI=45°



HR>99.5% @ 760-840 nm, AOI=45°



HRsp @ 1000-1060 GDD, AOI=45°

Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR

Size – Ø12.7 × 3 mm

257 – 275	99.0	041-0266-i0	71	99.0	041-0266	71
333 – 353	99.7	041-0343-i0	77	99.5	041-0343	77
380 – 420	99.7	041-0400-i0	67	99.5	041-0400	67
500 – 530	99.7	041-0515-i0	62	99.5	041-0515	62
760 – 840	99.7	041-0800-i0	75	99.5	041-0800	75
1000 – 1060	99.7	041-1030-i0	62	99.5	041-1030	62

Size – Ø12.7 × 6 mm

257 – 275	99.0	041-0266T6-i0	71	99.0	041-0266T6	71
333 – 353	99.7	041-0343T6-i0	77	99.5	041-0343T6	77
380 – 420	99.7	041-0400T6-i0	67	99.5	041-0400T6	67
500 – 530	99.7	041-0515T6-i0	62	99.5	041-0515T6	62
	99.9	041-0515T6HHR-i0	75	99.9	041-0515T6HHR	75
760 – 840	99.7	041-0800T6-i0	75	99.5	041-0800T6	75
	99.9	041-0800T6HHR-i0	108	99.9	041-0800T6HHR	108
1000 – 1060	99.7	041-1030T6-i0	62	99.5	041-1030T6	62
	99.9	041-1030T6HHR-i0	75	99.9	041-1030T6HHR	75

Size – Ø25.4 × 6 mm

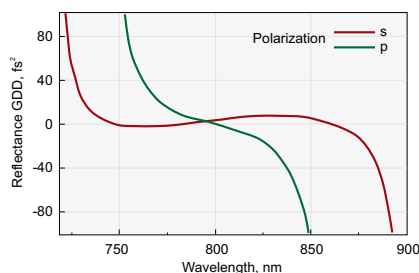
257 – 275	99.0	042-0266-i0	99	99.0	042-0266	99
333 – 353	99.7	042-0343-i0	107	99.5	042-0343	107
380 – 420	99.7	042-0400-i0	95	99.5	042-0400	95
500 – 530	99.7	042-0515-i0	90	99.5	042-0515	90
	99.9	042-0515HHR-i0	105	99.9	042-0515HHR	105
760 – 840	99.7	042-0800-i0	97	99.5	042-0800	97
	99.9	042-0800HHR-i0	130	99.9	042-0800HHR	130
1000 – 1060	99.7	042-1030-i0	90	99.5	042-1030	90
	99.9	042-1030HHR-i0	105	99.9	042-1030HHR	105
1400 – 1700	99.0	082-1417-i0	210	99.0	082-1417	210
1900 – 2120	99.8	082-1921-i0	210	99.8	082-1921	210

Size – Ø50.8 × 8 mm

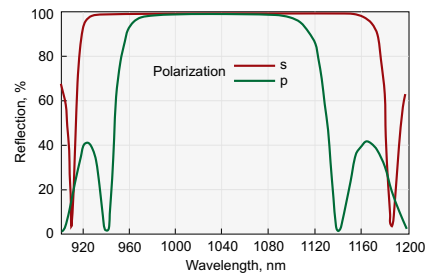
257 – 275	99.0	045-0266-i0	207	99.0	045-0266	207
333 – 353	99.7	045-0343-i0	187	99.5	045-0343	187
380 – 420	99.7	045-0400-i0	181	99.5	045-0400	181
500 – 530	99.7	045-0515-i0	169	99.5	045-0515	169
760 – 840	99.7	045-0800-i0	181	99.5	045-0800	181
1000 – 1060	99.7	045-1030-i0	169	99.5	045-1030	169

Size – Ø76.2 × 12.7 mm

257 – 275	99.0	047-0266-i0	290	99.0	047-0266	290
333 – 353	99.7	047-0343-i0	281	99.5	047-0343	281
380 – 420	99.7	047-0400-i0	272	99.5	047-0400	272
500 – 530	99.7	047-0515-i0	258	99.5	047-0515	258
760 – 840	99.7	047-0800-i0	272	99.5	047-0800	272
1000 – 1060	99.7	047-1030-i0	258	99.5	047-1030	258



HRsp @ 760-840 GDD, AOI=45°



HR>99.5% @ 1000-1060 nm, AOI=45°

DUAL BAND MIRRORS

SPECIFICATIONS

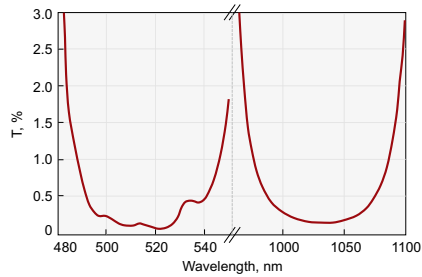
Coating	Hard dielectric High Reflection R>99.5%
Angle of Incidence	0 or 45±3°
Designed for average polarization	$R=(R_s+R_p)/2$
Laser Damage Threshold	>50 mJ/cm ² , 50 fsec pulse, 800 nm typical

SUBSTRATE

Material	UV grade Fused Silica or BK7 glas
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	±0.25 mm
Wedge	< 3 min
Chamfer	0.3 mm at 45° typical

DUAL BAND MIRRORS

Substrate material: **BK7 grade A**



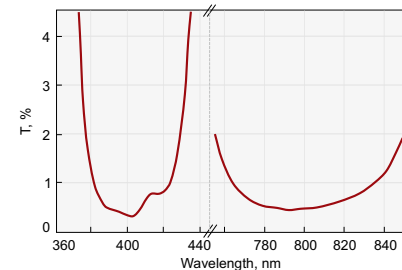
HR>99.5% @ 500-530 nm + 1000-1060 nm, AOI = 45°

Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
Size – Ø12.7 × 3 mm						
390-410 + 780-820	99.7	051-4080-i0	85	99.5	051-4080	85
500-530 + 1000-1060	99.7	051-5103-i0	85	99.5	051-5103	85
Size – Ø12.7 × 6 mm						
390-410 + 780-820	99.7	051-4080T6-i0	85	99.5	051-4080T6	85
500-530 + 1000-1060	99.7	051-5103T6-i0	85	99.5	051-5103T6	85
Size – Ø25.4 × 6 mm						
390-410 + 780-820	99.7	052-4080-i0	103	99.5	052-4080	103
500-530 + 1000-1060	99.7	052-5103-i0	103	99.5	052-5103	103
Size – Ø50.8 × 8 mm						
390-410 + 780-820	99.7	055-4080-i0	151	99.5	055-4080	151
500-530 + 1000-1060	99.7	055-5103-i0	151	99.5	055-5103	151
Size – Ø76.2 × 12.7 mm						
390-410 + 780-820	99.7	057-4080-i0	227	99.5	057-4080	227
500-530 + 1000-1060	99.7	057-5103-i0	227	99.5	057-5103	227

DUAL BAND MIRRORS

Substrate material: **UV grade Fused Silica**

Recommended for high power laser applications operating in UV region.



HR>99% @ 400 nm + 800 nm, AOI = 45°

Wavelength, nm	AOI=0°			AOI=45°		
	R, % (s+p)/2	Catalogue number	Price, EUR	R, % (s+p)/2	Catalogue number	Price, EUR
Size – Ø12.7 × 3 mm						
390-410 + 780-820	99.7	061-4080-i0	110	99.5	061-4080	110
500-530 + 1000-1060	99.7	061-5103-i0	110	99.5	061-5103	110
Size – Ø12.7 × 6 mm						
390-410 + 780-820	99.7	061-4080T6-i0	110	99.5	061-4080T6	110
500-530 + 1000-1060	99.7	061-5103T6-i0	110	99.5	061-5103T6	110
Size – Ø25.4 × 6 mm						
390-410 + 780-820	99.7	062-4080-i0	128	99.5	062-4080	128
500-530 + 1000-1060	99.7	062-5103-i0	128	99.5	062-5103	128
Size – Ø50.8 × 8 mm						
390-410 + 780-820	99.7	065-4080-i0	214	99.5	065-4080	214
500-530 + 1000-1060	99.7	065-5103-i0	214	99.5	065-5103	214
Size – Ø76.2 × 12.7 mm						
390-410 + 780-820	99.7	067-4080-i0	321	99.5	067-4080	321
500-530 + 1000-1060	99.7	067-5103-i0	321	99.5	067-5103	321

BROADBAND LOW GDD ULTRAFAST MIRRORS

FEATURES

- High reflectivity and low group delay dispersion in broad region centered at 800 nm
- $R_s > 99\%$ @ 700 – 930 nm, $|GDD_s| < 30 \text{ fs}^2$ @ 700 – 930 nm
- $R_p > 99\%$ @ 730 – 870 nm, $|GDD_p| < 30 \text{ fs}^2$ @ 730 – 870 nm
- $R > 99\%$ @ 720 – 880 nm, $|GDD| < 30 \text{ fs}^2$ @ 720 – 880 nm

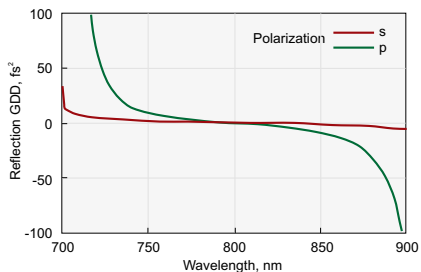
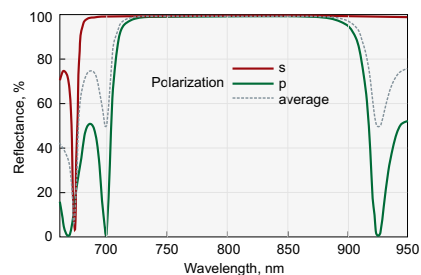
SPECIFICATIONS

Coating	Hard Dielectric High Reflection or Ion Beam Sputtering
Angle of Incidence	0 or $45 \pm 3^\circ$
Designed for average polarization	$R = (R_s + R_p)/2$
Laser Damage Threshold	$> 50 \text{ mJ/cm}^2$, 50 fsec pulse, 800 nm typical

SUBSTRATE

Material	UV grade Fused Silica or BK7 glas
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	$\pm 0.25 \text{ mm}$
Wedge	$< 3 \text{ min}$
Chamfer	0.3 mm at 45° typical

BROADBAND LOW GDD ULTRAFAST MIRRORS



$HR > 99\%$ @ 720–880 nm, $AOI = 45^\circ$

Wavelength, nm	Diameter, mm	Thickness, mm	AOI = 0°			R, % (s+p)/2	AOI = 45°	
			R, % (s+p)/2	Catalogue number	Price, EUR		Catalogue number	Price, EUR
Substrate material: BK7 grade A								
720-880	12.7	3.0	99.0	071-7288-i0	86	99.0	071-7288	86
720-880	12.7	6.0	99.0	071-7288T6-i0	86	99.0	071-7288T6	86
720-880	25.4	6.0	99.0	072-7288-i0	104	99.0	072-7288	104
720-880	38.1	8.0	99.0	074-7288-i0	195	99.0	074-7288	195
720-880	50.8	8.0	99.0	075-7288-i0	220	99.0	075-7288	220
720-880	76.2	12.7	99.0	077-7288-i0	395	99.0	077-7288	395
720-880	101.6	15.0	99.0	078-7288-i0	540	99.0	078-7288	540

Substrate material: UV grade Fused Silica

720–880	12.7	3.0	99.0	081-7288-i0	111	99.0	081-7288	111
720–880	12.7	6.0	99.0	081-7288T6-i0	111	99.0	081-7288T6	111
720–880	25.4	6.0	99.0	082-7288-i0	129	99.0	082-7288	129
720–880	25.4	6.0	99.9	082-7288HHR-i0	145	99.8	082-7288HHR	145
720–880	38.1	8.0	99.0	084-7288-i0	225	99.0	084-7288	225
720–880	50.8	8.0	99.0	085-7288-i0	255	99.0	085-7288	255
720–880	76.2	12.7	99.0	087-7288-i0	460	99.0	087-7288	460
720–880	101.6	15.0	99.0	088-7288-i0	612	99.0	088-7288	612

RELATED PRODUCTS

Metallic Coated Mirrors
See page 1.26

Kinematic Mirror / Beamsplitter
Mounts 840-0056
Find more at EksmaOptics.com

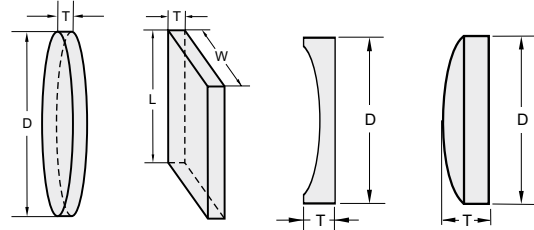


ENHANCED SILVER MIRRORS

FEATURES

- › LIDT – 0.25 J/cm² at 800 nm, 50 Hz, 94 fsec pulses
- › Round, square, flat or spherical mirrors available
- › Reflectivity R>98.5% @ 600 – 1100 nm, R>99% @ 700 – 900 nm
- › Operating angle of incidence from 0° to 45°
- › Group Delay Dispersion < | 5 fs² |

Enhanced silver mirrors are designed for applications with femtosecond lasers. These mirrors feature high reflectivity R>98.5% in the wavelength range from 600 nm to 1100 nm and R>99% @ 700 – 900 nm. Mirrors are relatively insensitive to angle of incidence and can be used in applications with AOI ranging from 0° to 45°.



Drawings of flat round, flat rectangular and spherical mirrors

FLAT RECTANGULAR MIRRORS. Substrate type: plano-plano

Width W, mm	Length L, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
15.0	20.0	6	BK7	091-0325F	55
20.0	30.0	6	BK7	092-0325F	82
25.4	25.4	6	BK7	093-0325F	80
25.4	50.8	10	BK7	094-0325F	115
50.8	50.8	10	BK7	095-0325F	155
15.0	20.0	6	UVFS	091-3325F	70
20.0	30.0	6	UVFS	092-3325F	92
25.4	25.4	6	UVFS	093-3325F	90
25.4	50.8	10	UVFS	094-3325F	135
50.8	50.8	10	UVFS	095-3325F	175

SPHERICAL MIRRORS. Diameter, D = 12.7 mm.

Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	091-0125FR-50	60
-75	Plano-concave	BK7	091-0125FR-75	60
-100	Plano-concave	BK7	091-0125FR-100	60
-150	Plano-concave	BK7	091-0125FR-150	60
-200	Plano-concave	BK7	091-0125FR-200	60
-250	Plano-concave	BK7	091-0125FR-250	60
-300	Plano-concave	BK7	091-0125FR-300	60
-400	Plano-concave	BK7	091-0125FR-400	60
-500	Plano-concave	BK7	091-0125FR-500	60
-1000	Plano-concave	BK7	091-0125FR-1000	60
-1500	Plano-concave	BK7	091-0125FR-1500	60
-2000	Plano-concave	BK7	091-0125FR-2000	60
-50	Plano-concave	UVFS	091-3125FR-50	86
-75	Plano-concave	UVFS	091-3125FR-75	86
-100	Plano-concave	UVFS	091-3125FR-100	86
-150	Plano-concave	UVFS	091-3125FR-150	86
-200	Plano-concave	UVFS	091-3125FR-200	86
-250	Plano-concave	UVFS	091-3125FR-250	86
-300	Plano-concave	UVFS	091-3125FR-300	86
-400	Plano-concave	UVFS	091-3125FR-400	86
-500	Plano-concave	UVFS	091-3125FR-500	86
-1000	Plano-concave	UVFS	091-3125FR-1000	86
-1500	Plano-concave	UVFS	091-3125FR-1500	86
-2000	Plano-concave	UVFS	091-3125FR-2000	86

FLAT ROUND MIRRORS. Substrate type: plano-plano

Diameter D, mm	Thickness T, mm	Substrate material	Catalogue number	Price, EUR
Ø12.7	3	BK7	091-0025F	45
Ø12.7	6	BK7	091-0025FT6	45
Ø25.4	6	BK7	092-0025F	75
Ø50.8	8	BK7	095-0025F	145
Ø76.2	12.7	BK7	097-0025F	300
Ø101.6	15	BK7	098-0025F	450
Ø12.7	3	UVFS	091-3025F	56
Ø12.7	6	UVFS	091-3025FT6	56
Ø25.4	6	UVFS	092-3025F	85
Ø50.8	8	UVFS	095-3025F	162
Ø76.2	12.7	UVFS	097-3025F	355
Ø101.6	15	UVFS	098-3025F	530

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+50	Plano-convex	BK7	091-0225FR+50	62
+100	Plano-convex	BK7	091-0225FR+100	62
+150	Plano-convex	BK7	091-0225FR+150	62
+200	Plano-convex	BK7	091-0225FR+200	62
+300	Plano-convex	BK7	091-0225FR+300	62
+400	Plano-convex	BK7	091-0225FR+400	62
+500	Plano-convex	BK7	091-0225FR+500	62
+50	Plano-convex	UVFS	091-3225FR+50	89
+100	Plano-convex	UVFS	091-3225FR+100	89
+150	Plano-convex	UVFS	091-3225FR+150	89
+200	Plano-convex	UVFS	091-3225FR+200	89
+300	Plano-convex	UVFS	091-3225FR+300	89
+400	Plano-convex	UVFS	091-3225FR+400	89
+500	Plano-convex	UVFS	091-3225FR+500	89

SPHERICAL MIRRORS. Diameter, D = 25.4 mm.

Thickness (edge for plano-concave, center for plano-convex), T = 6.0 mm

OPTICAL
COMPONENTS

NONLINEAR & LASER
CRYSTALS

ND:YAG LASERLINE
COMPONENTS

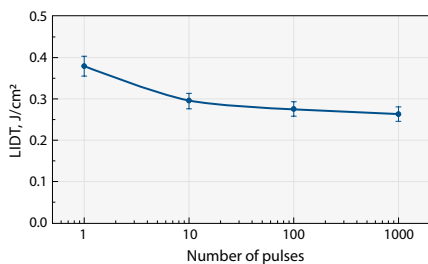
FEMTOLINE
COMPONENTS

OPTICAL
SYSTEMS

OPTO-MECHANICAL
COMPONENTS

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-50	Plano-concave	BK7	092-0125FR-50	105
-75	Plano-concave	BK7	092-0125FR-75	105
-100	Plano-concave	BK7	092-0125FR-100	105
-150	Plano-concave	BK7	092-0125FR-150	105
-200	Plano-concave	BK7	092-0125FR-200	105
-250	Plano-concave	BK7	092-0125FR-250	105
-300	Plano-concave	BK7	092-0125FR-300	105
-400	Plano-concave	BK7	092-0125FR-400	105
-500	Plano-concave	BK7	092-0125FR-500	105
-600	Plano-concave	BK7	092-0125FR-600	105
-700	Plano-concave	BK7	092-0125FR-700	105
-750	Plano-concave	BK7	092-0125FR-750	105
-800	Plano-concave	BK7	092-0125FR-800	105
-1000	Plano-concave	BK7	092-0125FR-1000	105
-1500	Plano-concave	BK7	092-0125FR-1500	105
-2000	Plano-concave	BK7	092-0125FR-2000	105
-2500	Plano-concave	BK7	092-0125FR-2500	105
-3000	Plano-concave	BK7	092-0125FR-3000	105
-4000	Plano-concave	BK7	092-0125FR-4000	105
-5000	Plano-concave	BK7	092-0125FR-5000	105
-6000	Plano-concave	BK7	092-0125FR-6000	105
-8000	Plano-concave	BK7	092-0125FR-8000	105
-50	Plano-concave	UVFS	092-0125FR-50	135
-75	Plano-concave	UVFS	092-0125FR-75	135
-100	Plano-concave	UVFS	092-0125FR-100	135
-150	Plano-concave	UVFS	092-0125FR-150	135
-200	Plano-concave	UVFS	092-0125FR-200	135
-250	Plano-concave	UVFS	092-0125FR-250	135
-300	Plano-concave	UVFS	092-0125FR-300	135
-400	Plano-concave	UVFS	092-0125FR-400	135
-500	Plano-concave	UVFS	092-0125FR-500	135
-600	Plano-concave	UVFS	092-3125FR-600	135
-700	Plano-concave	UVFS	092-3125FR-700	135
-750	Plano-concave	UVFS	092-3125FR-750	135
-800	Plano-concave	UVFS	092-3125FR-800	135
-1000	Plano-concave	UVFS	092-3125FR-1000	135
-1500	Plano-concave	UVFS	092-3125FR-1500	135
-2000	Plano-concave	UVFS	092-3125FR-2000	135
-2500	Plano-concave	UVFS	092-3125FR-2500	135
-3000	Plano-concave	UVFS	092-3125FR-3000	135
-4000	Plano-concave	UVFS	092-3125FR-4000	135
-5000	Plano-concave	UVFS	092-3125FR-5000	135
-6000	Plano-concave	UVFS	092-3125FR-6000	135
-8000	Plano-concave	UVFS	092-3125FR-8000	135

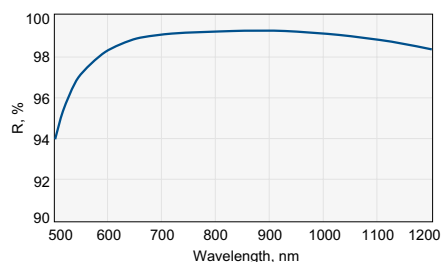
Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
+50	Plano-convex	BK7	092-0225FR+50	110
+100	Plano-convex	BK7	092-0225FR+100	110
+150	Plano-convex	BK7	092-0225FR+150	110
+200	Plano-convex	BK7	092-0225FR+200	110
+300	Plano-convex	BK7	092-0225FR+300	110
+400	Plano-convex	BK7	092-0225FR+400	110
+500	Plano-convex	BK7	092-0225FR+500	110
+600	Plano-convex	BK7	092-0225FR+600	110
+800	Plano-convex	BK7	092-0225FR+800	110
+1000	Plano-convex	BK7	092-0225FR+1000	110
+1500	Plano-convex	BK7	092-0225FR+1500	110
+2000	Plano-convex	BK7	092-0225FR+2000	110
+4000	Plano-convex	BK7	092-0225FR+4000	110
+5000	Plano-convex	BK7	092-0225FR+5000	110
+50	Plano-convex	UVFS	092-3225FR+50	140
+100	Plano-convex	UVFS	092-3225FR+100	140
+150	Plano-convex	UVFS	092-3225FR+150	140
+200	Plano-convex	UVFS	092-3225FR+200	140
+300	Plano-convex	UVFS	092-3225FR+300	140
+400	Plano-convex	UVFS	092-3225FR+400	140
+500	Plano-convex	UVFS	092-3225FR+500	140
+600	Plano-convex	UVFS	092-3225FR+600	140
+800	Plano-convex	UVFS	092-3225FR+800	140
+1000	Plano-convex	UVFS	092-3225FR+1000	140
+1500	Plano-convex	UVFS	092-3225FR+1500	140
+2000	Plano-convex	UVFS	092-3225FR+2000	140
+4000	Plano-convex	UVFS	092-3225FR+4000	140
+5000	Plano-convex	UVFS	092-3225FR+5000	140



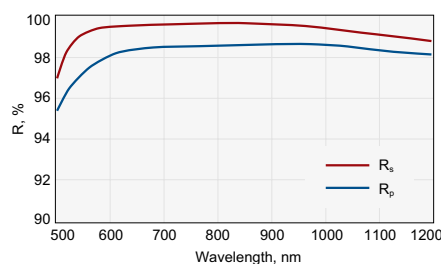
LIDT of enhanced silver mirrors, AOI=45° @ 800 nm, 100 fs, 100 Hz

TEST CONDITIONS:

Wavelength	800 nm
Pulse duration	99.9 fs
Repetition rate	100 Hz
AOI	45°
Polarization	linear P
Beam diameter (1/e²)	(143 ± 2.3) μm



Reflectivity of enhanced silver mirrors, AOI=0°



Reflectivity of enhanced silver mirrors, AOI=45°

SPHERICAL MIRRORS. Diameter, D = 50.8 mm.

Thickness (edge for plano-concave, center for plano-convex), T = 10.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-100	Plano-concave	BK7	095-0125FR-100	210
-150	Plano-concave	BK7	095-0125FR-150	210
-200	Plano-concave	BK7	095-0125FR-200	210
-250	Plano-concave	BK7	095-0125FR-250	210
-300	Plano-concave	BK7	095-0125FR-300	210
-400	Plano-concave	BK7	095-0125FR-400	210
-500	Plano-concave	BK7	095-0125FR-500	210
-600	Plano-concave	BK7	095-0125FR-600	210
-800	Plano-concave	BK7	095-0125FR-800	210
-1000	Plano-concave	BK7	095-0125FR-1000	210
-1500	Plano-concave	BK7	095-0125FR-1500	210
-2000	Plano-concave	BK7	095-0125FR-2000	210
-2500	Plano-concave	BK7	095-0125FR-2500	210
-3000	Plano-concave	BK7	095-0125FR-3000	210
-4000	Plano-concave	BK7	095-0125FR-4000	210
-5000	Plano-concave	BK7	095-0125FR-5000	210
-6000	Plano-concave	BK7	095-0125FR-6000	210
-8000	Plano-concave	BK7	095-0125FR-8000	210
-10000	Plano-concave	BK7	095-0125FR-10000	210
-100	Plano-concave	UVFS	095-3125FR-100	245
-150	Plano-concave	UVFS	095-3125FR-150	245
-200	Plano-concave	UVFS	095-3125FR-200	245
-250	Plano-concave	UVFS	095-3125FR-250	245
-300	Plano-concave	UVFS	095-3125FR-300	245
-400	Plano-concave	UVFS	095-3125FR-400	245
-500	Plano-concave	UVFS	095-3125FR-500	245
-600	Plano-concave	UVFS	095-3125FR-600	245
-800	Plano-concave	UVFS	095-3125FR-800	245
-1000	Plano-concave	UVFS	095-3125FR-1000	245
-1500	Plano-concave	UVFS	095-3125FR-1500	245
-2000	Plano-concave	UVFS	095-3125FR-2000	245
-2500	Plano-concave	UVFS	095-3125FR-2500	245
-3000	Plano-concave	UVFS	095-3125FR-3000	245
-4000	Plano-concave	UVFS	095-3125FR-4000	245
-5000	Plano-concave	UVFS	095-3125FR-5000	245
-6000	Plano-concave	UVFS	095-3125FR-6000	245
-8000	Plano-concave	UVFS	095-3125FR-8000	245
-10000	Plano-concave	UVFS	095-3125FR-10000	245
+100	Plano-convex	BK7	095-0225FR+100	220
+150	Plano-convex	BK7	095-0225FR+150	220
+200	Plano-convex	BK7	095-0225FR+200	220
+300	Plano-convex	BK7	095-0225FR+300	220
+400	Plano-convex	BK7	095-0225FR+400	220
+500	Plano-convex	BK7	095-0225FR+500	220
+600	Plano-convex	BK7	095-0225FR+600	220
+800	Plano-convex	BK7	095-0225FR+800	220
+1000	Plano-convex	BK7	095-0225FR+1000	220
+1500	Plano-convex	BK7	095-0225FR+1500	220
+2000	Plano-convex	BK7	095-0225FR+2000	220
+100	Plano-convex	UVFS	095-3225FR+100	255
+150	Plano-convex	UVFS	095-3225FR+150	255
+200	Plano-convex	UVFS	095-3225FR+200	255
+300	Plano-convex	UVFS	095-3225FR+300	255
+400	Plano-convex	UVFS	095-3225FR+400	255
+500	Plano-convex	UVFS	095-3225FR+500	255
+600	Plano-convex	UVFS	095-3225FR+600	255
+800	Plano-convex	UVFS	095-3225FR+800	255
+1000	Plano-convex	UVFS	095-3225FR+1000	255
+1500	Plano-convex	UVFS	095-3225FR+1500	255
+2000	Plano-convex	UVFS	095-3225FR+2000	255

SPHERICAL MIRRORS. Diameter, D = 76.2 mm.

Thickness (edge for plano-concave, center for plano-convex), T = 12.7 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-200	Plano-concave	BK7	097-0125FR-200	390
-300	Plano-concave	BK7	097-0125FR-300	390
-400	Plano-concave	BK7	097-0125FR-400	390
-500	Plano-concave	BK7	097-0125FR-500	390
-600	Plano-concave	BK7	097-0125FR-600	390
-800	Plano-concave	BK7	097-0125FR-800	390
-1000	Plano-concave	BK7	097-0125FR-1000	390
-2000	Plano-concave	BK7	097-0125FR-2000	390
-3000	Plano-concave	BK7	097-0125FR-3000	390
-200	Plano-concave	UVFS	097-3125FR-200	480
-300	Plano-concave	UVFS	097-3125FR-300	480
-400	Plano-concave	UVFS	097-3125FR-400	480
-500	Plano-concave	UVFS	097-3125FR-500	480
-600	Plano-concave	UVFS	097-3125FR-600	480
-800	Plano-concave	UVFS	097-3125FR-800	480
-1000	Plano-concave	UVFS	097-3125FR-1000	480
-2000	Plano-concave	UVFS	097-3125FR-2000	480
-3000	Plano-concave	UVFS	097-3125FR-3000	480

SPHERICAL MIRRORS. Diameter, D = 101.6 mm.

Thickness (edge for plano-concave, center for plano-convex), T = 15.0 mm

Radius, mm	Substrate type	Substrate material	Catalogue number	Price, EUR
-300	Plano-concave	BK7	098-0125FR-300	650
-400	Plano-concave	BK7	098-0125FR-400	650
-500	Plano-concave	BK7	098-0125FR-500	650
-600	Plano-concave	BK7	098-0125FR-600	650
-800	Plano-concave	BK7	098-0125FR-800	650
-1000	Plano-concave	BK7	098-0125FR-1000	650
-2000	Plano-concave	BK7	098-0125FR-2000	650
-3000	Plano-concave	BK7	098-0125FR-3000	650
-300	Plano-concave	UVFS	098-3125FR-300	750
-400	Plano-concave	UVFS	098-3125FR-400	750
-500	Plano-concave	UVFS	098-3125FR-500	750
-600	Plano-concave	UVFS	098-3125FR-600	750
-800	Plano-concave	UVFS	098-3125FR-800	750
-1000	Plano-concave	UVFS	098-3125FR-1000	750
-2000	Plano-concave	UVFS	098-3125FR-2000	750
-3000	Plano-concave	UVFS	098-3125FR-3000	750

LASER HARMONIC SEPARATORS

FEATURES

- Offered on Ø 0.5 or 1 inch UV FS substrates with surface flatness $\lambda/10$

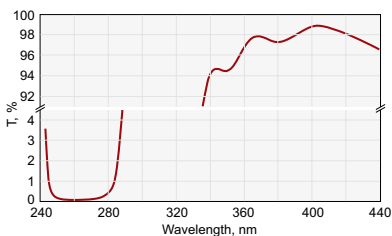
Harmonic separators are dichroic beamsplitters that reflect one wavelength and transmit others. Reflectance is better than 99.5% for the wavelength of interest and transmittance is at least 90% for the rejected wavelengths. The rear surface of harmonic separators is antireflection coated. If possible use shorter wavelength for reflection and longer wavelengths for transmission in order to have higher reflection/transmission coefficients.

COATING

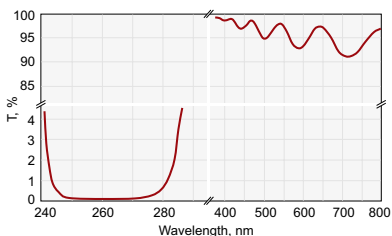
Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture
Back side antireflection coated	AOI 45°, R<0.5% AOI 0°, R<0.25%
Laser Damage Threshold	>100 mJ/cm ² , 50 fsec pulse, 800 nm typical

SUBSTRATE

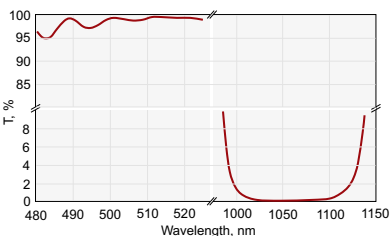
Material	UV grade Fused Silica
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	$\lambda/10$ typical at 633 nm
S2 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	±0.25 mm
Parallelism	< 30 arcsec
Chamfer	0.3 mm at 45° typical



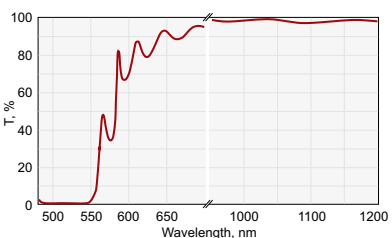
042-2405. HR>99.5% @ 257-275 nm +
HT>95% @ 390-410 nm, AOI=45°



042-2485. HR>99.5% @ 257-275 nm +
HT>90% @ 400+800 nm, AOI=45°



042-6515. HR>99.5% @ 1030 nm +
HT>93% @ 515 nm, AOI=45°



042-5135. HR>99.5% @ 500-530 nm +
HT>95% @ 1000-1060 nm, AOI=45°

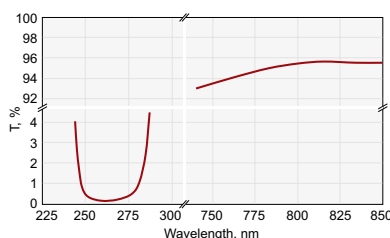
Reflected wavelength, nm, R > 99.5%	Transmitted wavelength, nm	Transmission, %	Ø12.7x3 mm		Ø25.4x3 mm		Ø50.8x8 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR

AOI = 0 deg. Substrate material: UV grade Fused Silica

257 – 275	780 – 820	>95	041-2800	145	042-2800	175	045-2800	265
257 – 275	390 – 410	>95	041-2400	145	042-2400	175	045-2400	265
257 – 275	400 + 800	>90	041-2480	165	042-2480	195	045-2480	295
390 – 410	780 – 820	>95	041-4800	145	042-4800	175	045-4800	265
800	400	>93	041-0840	140	042-0840	170	045-0840	255
333 – 353	1000 – 1060	>95	041-3130	135	042-3130	165	045-3130	245
333 – 353	500 – 530	>95	041-3450	135	042-3450	165	045-3450	245
333 – 353	515 + 1030	>90	041-3530	155	042-3530	185	045-3530	275
500 – 530	1000 – 1060	>95	041-5130	135	042-5130	165	045-5130	245
1030	515	>93	041-6510	140	042-6510	170	045-6510	255

AOI = 45 deg. Substrate material: UV grade Fused Silica

257 – 275	780 – 820	>95	041-2805	145	042-2805	175	045-2805	265
257 – 275	390 – 410	>95	041-2405	145	042-2405	175	045-2405	265
257 – 275	400 + 800	>90	041-2485	165	042-2485	195	045-2485	295
390 – 410	780 – 820	>95	041-4805	145	042-4805	175	045-4805	265
800	400	>93	041-0845	140	042-0845	170	045-0845	255
333 – 353	1000 – 1060	>95	041-3135	135	042-3135	165	045-3135	245
333 – 353	500 – 530	>95	041-3455	135	042-3455	165	045-3455	245
333 – 353	515 + 1030	>90	041-3535	155	042-3535	185	045-3535	275
500 – 530	1000 – 1060	>95	041-5135	135	042-5135	165	045-5135	245
1030	515	>93	041-6515	140	042-6515	170	045-6515	255



042-2805. HR>99.5% @ 257-275 nm +
HT>95% @ 780-820, AOI=45°

RELATED PRODUCTS

Pellin-Broca Prisms.

See page 1.53

Adapter for Beamsplitter at 45° 840-0116.

Find more at EksmaOptics.com

Kinematic Mirror and Beamsplitter Mount 840-0020.

Find more at EksmaOptics.com

LASER OUTPUT COUPLERS

FEATURES

➤ Low Group Delay Dispersion

An output coupler is a partially reflecting dielectric mirror used in a laser cavity. It transmits a part of the circulating intracavity power for generating a useful output from the laser.

A low transmission output coupler leads to low laser threshold and possibly to poor laser efficiency if the losses due to output coupling do not dominate other parasitic losses in the laser cavity. The output coupler transmission is often chosen to maximize the output power, although its optimum value may be lower or higher if there are other design purposes (minimizing intracavity intensities or suppressing Q-switching instabilities in a passively mode-locked laser).

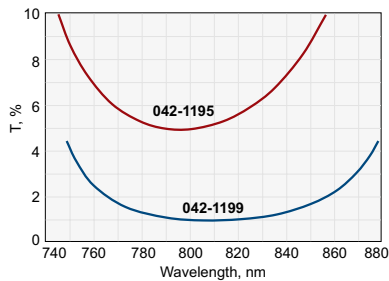
The standard substrates are parallel within 30 arcsec. If you need wedged substrates, please, choose from chapter Wedge Prisms (page 1.51).

COATING

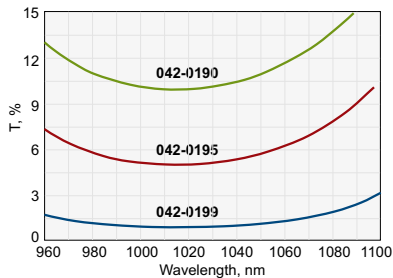
Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Angle of Incidence	0 – 8°
Parallelism	30 arcsec
Back side antireflection coated	R < 0.25%
Laser Damage Threshold	> 100 mJ/cm ² , 50 fsec pulse, 800 nm typical

SUBSTRATE

Material	UV grade Fused Silica
S1 Surface Flatness	$\lambda/10$ typical at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	$\lambda/10$ typical at 633 nm
S2 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	±0.25 mm
Parallelism	< 30 arcsec
Chamfer	0.3 mm at 45° typical



042-1199. PR = 99±0.5% @ 800 nm, T = 1±0.5%
042-1195. PR = 95±2% @ 800 nm, T = 5±2%



042-0199. PR = 99±0.5% @ 1030 nm, T = 1±0.5%
042-0195. PR = 95±2% @ 1030 nm, T = 5±2%
042-0190. PR = 90±2% @ 1030 nm, T = 10±2%

Wavelength, nm	Reflection, %	Transmission, %	Ø12.7x3 mm		Ø25.4x3 mm		Ø50.8x8 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
Substrate material: UV grade Fused Silica								
1030	50±3	50±3	041-0150	105	042-0150	125	045-0150	205
1030	60±3	40±3	041-0160	105	042-0160	125	045-0160	205
1030	65±3	35±3	041-0165	105	042-0165	125	045-0165	205
1030	70±3	30±3	041-0170	105	042-0170	125	045-0170	205
1030	75±3	25±3	041-0175	105	042-0175	125	045-0175	205
1030	80±3	20±3	041-0180	105	042-0180	125	045-0180	205
1030	85±3	15±3	041-0185	105	042-0185	125	045-0185	205
1030	90±2	10±2	041-0190	112	042-0190	132	045-0190	220
1030	95±2	5±2	041-0195	112	042-0195	132	045-0195	220
1030	97±1	3±1	041-0197	119	042-0197	139	045-0197	245
1030	98±1	2±1	041-0198	119	042-0198	139	045-0198	245
1030	99.0±0.5	1.0±0.5	041-0199	126	042-0199	146	045-0199	255
800	50±3	50±3	041-1150	105	042-1150	125	045-1150	205
800	60±3	40±3	041-1160	105	042-1160	125	045-1160	205
800	65±3	35±3	041-1165	105	042-1165	125	045-1165	205
800	70±3	30±3	041-1170	105	042-1170	125	045-1170	205
800	75±3	25±3	041-1175	105	042-1175	125	045-1175	205
800	80±3	20±3	041-1180	105	042-1180	125	045-1180	205
800	85±3	15±3	041-1185	105	042-1185	125	045-1185	205
800	90±2	10±2	041-1190	112	042-1190	132	045-1190	220
800	95±2	5±2	041-1195	112	042-1195	132	045-1195	220
800	97±1	3±1	041-1197	119	042-1197	139	045-1197	245
800	98±1	2±1	041-1198	119	042-1198	139	045-1198	245
800	99.0±0.5	1.0±0.5	041-1199	126	042-1199	146	045-1199	255

RELATED PRODUCTS

Uncoated Elliptical Mirrors
 See page 1.10

Kinematic Mirror
 and Beamsplitter
 Mount 840-0020
 Find more at EksmaOptics.com



LASER REAR MIRRORS

High reflectivity ($R > 99.8\%$) dielectric coatings with high laser damage threshold are applied on laser rear mirrors. UV FS substrates are recommended for high power laser applications.

Back side can be AR coated to avoid back reflection from second surface on request.

COATING

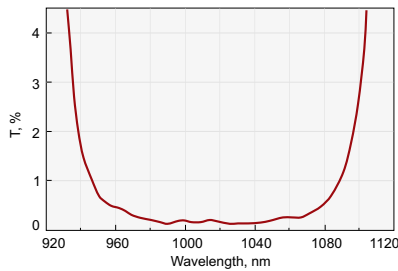
Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Angle of Incidence	0 – 8° (normal)
Coating	Hard dielectric high reflection: R>99.7% at 800 nm and 1030 nm R>99% at 720 – 880 nm
Laser Damage Threshold	>100 mJ/cm ² , 50 fsec pulse, 800 nm typical

SUBSTRATE

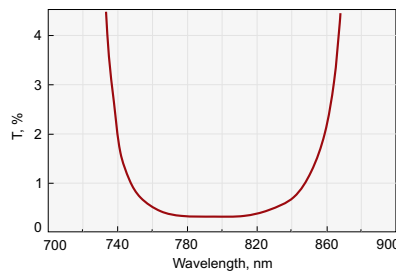
Material	UV grade Fused Silica or BK7 glass
S1 Surface Flatness	$\lambda/10$ at 633 nm
S1 Surface Quality	20 – 10 scratch & dig (MIL-PRF-13830B)
S2 Surface Quality	Commercial polish
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	± 0.25
Chamfer	0.3 mm at 45° typical

Wavelength, nm	Substrate type	Radius, mm	Substrate material BK7				Substrate material UVFS			
			Ø25.4×6 mm		Ø50.8×10 mm		Ø25.4×6 mm		Ø50.8×10 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030±30	Plano-plano	∞	032-1030-i0	75	035-1030-i0 *	110	042-1030-i0	90	045-1030-i0 *	169
1030±30	Plano-concave	-50	012-8005	99	015-8005	145	022-8005	119	025-8005	209
1030±30	Plano-concave	-100	012-8010	99	015-8010	145	022-8010	119	025-8010	209
1030±30	Plano-concave	-150	012-8015	99	015-8015	145	022-8015	119	025-8015	209
1030±30	Plano-concave	-200	012-8020	99	015-8020	145	022-8020	119	025-8020	209
1030±30	Plano-concave	-250	012-8025	99	015-8025	145	022-8025	119	025-8025	209
1030±30	Plano-concave	-500	012-8050	99	015-8050	145	022-8050	119	025-8050	209
1030±30	Plano-concave	-1000	012-8100	99	015-8100	145	022-8100	119	025-8100	209
1030±30	Plano-concave	-2000	012-8200	99	015-8200	145	022-8200	119	025-8200	209
1030±30	Plano-concave	-2500	012-8250	99	015-8250	145	022-8250	119	025-8250	209
1030±30	Plano-concave	-4000	012-8400	99	015-8400	145	022-8400	119	025-8400	209
1030±30	Plano-concave	-5000	012-8500	99	015-8500	145	022-8500	119	025-8500	209
1030±30	Plano-convex	+100	012-9010	103	015-9010	155	022-9010	123	025-9010	219
1030±30	Plano-convex	+200	012-9020	103	015-9020	155	022-9020	123	025-9020	219
1030±30	Plano-convex	+500	012-9050	103	015-9050	155	022-9050	123	025-9050	219
1030±30	Plano-convex	+1000	012-9100	103	015-9100	155	022-9100	123	025-9100	219
1030±30	Plano-convex	+2000	012-9200	103	015-9200	155	022-9200	123	025-9200	219
1030±30	Plano-convex	+4000	012-9400	103	015-9400	155	022-9400	123	025-9400	219

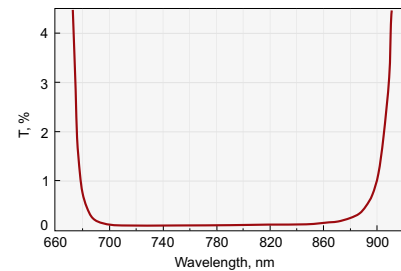
* Thickness of plano-plano rear mirrors of Ø50.8 is 8 mm.



HR>99.7% @ 1030±30 nm, AOI=0°



HR>99.7% @ 800±20 nm, AOI=0°



HR>99.0% @ 720 – 880 nm, AOI=0°

Wavelength, nm	Substrate type	Radius, mm	Substrate material BK7				Substrate material UVFS			
			Ø25.4×6 mm		Ø50.8×10 mm		Ø25.4×6 mm		Ø50.8×10 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
800±30	Plano-plano	-∞	032-0800-i0	85	035-0800-i0 *	133	042-0800-i0	97	045-0800-i0 *	181
800±30	Plano-concave	-50	062-8005	99	065-8005	145	082-8005	119	085-8005	209
800±30	Plano-concave	-100	062-8010	99	065-8010	145	082-8010	119	085-8010	209
800±30	Plano-concave	-150	062-8015	99	065-8015	145	082-8015	119	085-8015	209
800±30	Plano-concave	-200	062-8020	99	065-8020	145	082-8020	119	085-8020	209
800±30	Plano-concave	-250	062-8025	99	065-8025	145	082-8025	119	085-8025	209
800±30	Plano-concave	-500	062-8050	99	065-8050	145	082-8050	119	085-8050	209
800±30	Plano-concave	-1000	062-8100	99	065-8100	145	082-8100	119	085-8100	209
800±30	Plano-concave	-2000	062-8200	99	065-8200	145	082-8200	119	085-8200	209
800±30	Plano-concave	-2500	062-8250	99	065-8250	145	082-8250	119	085-8250	209
800±30	Plano-concave	-4000	062-8400	99	065-8400	145	082-8400	119	085-8400	209
800±30	Plano-concave	-5000	062-8500	99	065-8500	145	082-8500	119	085-8500	209
800±30	Plano-convex	+100	062-9010	103	065-9010	155	082-9010	123	085-9010	219
800±30	Plano-convex	+200	062-9020	103	065-9020	155	082-9020	123	085-9020	219
800±30	Plano-convex	+500	062-9050	103	065-9050	155	082-9050	123	085-9050	219
800±30	Plano-convex	+1000	062-9100	103	065-9100	155	082-9100	123	085-9100	219
800±30	Plano-convex	+2000	062-9200	103	065-9200	155	082-9200	123	085-9200	219
800±30	Plano-convex	+4000	062-9400	103	065-9400	155	082-9400	123	085-9400	219

* Thickness of plano-plano rear mirrors of Ø50.8 is 8 mm.

Wavelength, nm	Substrate type	Radius, mm	Substrate material BK7				Substrate material UVFS			
			Ø25.4×6 mm		Ø50.8×10 mm		Ø25.4×6 mm		Ø50.8×10 mm	
			Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
720 – 880	Plano-plano	-∞	072-7288-i0	104	075-7288-i0 *	220	082-7288-i0	129	085-7288-i0 *	255
720 – 880	Plano-concave	-50	062-8005B	128	065-8005B	245	082-8005B	153	085-8005B	280
720 – 880	Plano-concave	-100	062-8010B	128	065-8010B	245	082-8010B	153	085-8010B	280
720 – 880	Plano-concave	-150	062-8015B	128	065-8015B	245	082-8015B	153	085-8015B	280
720 – 880	Plano-concave	-200	062-8020B	128	065-8020B	245	082-8020B	153	085-8020B	280
720 – 880	Plano-concave	-250	062-8025B	128	065-8025B	245	082-8025B	153	085-8025B	280
720 – 880	Plano-concave	-500	062-8050B	128	065-8050B	245	082-8050B	153	085-8050B	280
720 – 880	Plano-concave	-1000	062-8100B	128	065-8100B	245	082-8100B	153	085-8100B	280
720 – 880	Plano-concave	-2000	062-8200B	128	065-8200B	245	082-8200B	153	085-8200B	280
720 – 880	Plano-concave	-2500	062-8250B	128	065-8250B	245	082-8250B	153	085-8250B	280
720 – 880	Plano-concave	-3000	062-8300B	128	065-8300B	245	082-8300B	153	085-8300B	280
720 – 880	Plano-concave	-4000	062-8400B	128	065-8400B	245	082-8400B	153	085-8400B	280
720 – 880	Plano-concave	-5000	062-8500B	128	065-8500B	245	082-8500B	153	085-8500B	280
720 – 880	Plano-convex	+100	062-9010B	132	065-9010B	250	082-9010B	157	085-9010B	285
720 – 880	Plano-convex	+200	062-9020B	132	065-9020B	250	082-9020B	157	085-9020B	285
720 – 880	Plano-convex	+500	062-9050B	132	065-9050B	250	082-9050B	157	085-9050B	285
720 – 880	Plano-convex	+600	062-9060B	132	065-9060B	250	082-9060B	157	085-9060B	285
720 – 880	Plano-convex	+1000	062-9100B	132	065-9100B	250	082-9100B	157	085-9100B	285
720 – 880	Plano-convex	+1500	062-9150B	132	065-9150B	250	082-9150B	157	085-9150B	285
720 – 880	Plano-convex	+2000	062-9200B	132	065-9200B	250	082-9200B	157	085-9200B	285
720 – 880	Plano-convex	+4000	062-9400B	132	065-9400B	250	082-9400B	157	085-9400B	285

* Thickness of plano-plano rear mirrors of Ø50.8 is 8 mm.

RELATED PRODUCTS

Uncoated Curved Windows

See page 1.8

Kinematic Mirror Mount 840-0010

Find more at [EksmaOptics.com](#)



Kinematic Mirror and Beamsplitter Mount 840-0020

Find more at [EksmaOptics.com](#)



LASER BEAMSPLITTERS

Beamsplitter splits average polarized laser beam in two beams separated 90° from each other. The standard substrate thickness is 3 mm. If you need thinner substrate, please, choose from chapter Precision Thin Round Windows (page 1.11).

Please contact us for wedged beamsplitters or choose wedged substrates from Wedge Prisms (page 1.51)

COATING

Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Angle of Incidence	45±3°
Back side antireflection coated	R<0.5%

SUBSTRATE

Material	UV grade Fused Silica
S1 Surface Flatness	λ/10 typical at 633 nm
S1 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
S2 Surface Flatness	λ/10 typical at 633 nm
S2 Surface Quality	20–10 scratch & dig (MIL-PRF-13830B)
Diameter Tolerance	+0.00 mm; -0.12 mm
Thickness Tolerance	±0.25 mm
Parallelism	< 30 arcsec
Chamfer	0.3 mm at 45° typical

DESIGNED FOR AVERAGE POLARIZATION: $R=(R_s+R_p)/2$ and $T=(T_s+T_p)/2$. Laser Damage Threshold: >100 mJ/cm², 50 fsec pulse, 800 nm typical

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø12.7 × 3 mm		Ø25.4 × 3 mm		Ø50.8 × 8 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	20±3	80±3	UV FS	031-7420A	105	032-7420A	125	035-7420A	205
1030	30±3	70±3	UV FS	031-7430A	105	032-7430A	125	035-7430A	205
1030	50±3	50±3	UV FS	031-7450A	105	032-7450A	125	035-7450A	205
1030	70±3	30±3	UV FS	031-7470A	105	032-7470A	125	035-7470A	205
1030	80±3	20±3	UV FS	031-7480A	105	032-7480A	125	035-7480A	205
515	20±3	80±3	UV FS	031-7520A	103	032-7520A	123	035-7520A	200
515	30±3	70±3	UV FS	031-7530A	103	032-7530A	123	035-7530A	200
515	50±3	50±3	UV FS	031-7550A	103	032-7550A	123	035-7550A	200
515	70±3	30±3	UV FS	031-7570A	103	032-7570A	123	035-7570A	200
515	80±3	20±3	UV FS	031-7580A	103	032-7580A	123	035-7580A	200
343	20±3	80±3	UV FS	031-7620A	110	032-7620A	140	035-7620A	245
343	30±3	70±3	UV FS	031-7630A	110	032-7630A	140	035-7630A	245
343	50±3	50±3	UV FS	031-7650A	110	032-7650A	140	035-7650A	245
343	70±3	30±3	UV FS	031-7670A	110	032-7670A	140	035-7670A	245
343	80±3	20±3	UV FS	031-7680A	110	032-7680A	140	035-7680A	245
800	20±3	80±3	UV FS	041-7720A	105	042-7720A	125	045-7720A	205
800	30±3	70±3	UV FS	041-7730A	105	042-7730A	125	045-7730A	205
800	50±3	50±3	UV FS	041-7750A	105	042-7750A	125	045-7750A	205
800	70±3	30±3	UV FS	041-7770A	105	042-7770A	125	045-7770A	205
800	80±3	20±3	UV FS	041-7780A	105	042-7780A	125	045-7780A	205
400	20±3	80±3	UV FS	041-7820A	103	042-7820A	123	045-7820A	200
400	30±3	70±3	UV FS	041-7830A	103	042-7830A	123	045-7830A	200
400	50±3	50±3	UV FS	041-7850A	103	042-7850A	123	045-7850A	200
400	70±3	30±3	UV FS	041-7870A	103	042-7870A	123	045-7870A	200
400	80±3	20±3	UV FS	041-7880A	103	042-7880A	123	045-7880A	200
266	20±3	80±3	UV FS	041-7920A	115	042-7920FA	145	045-7920A	265
266	30±3	70±3	UV FS	041-7930A	115	042-7930FA	145	045-7930A	265
266	50±3	50±3	UV FS	041-7950A	115	042-7950FA	145	045-7950A	265
266	70±3	30±3	UV FS	041-7970A	115	042-7970FA	145	045-7970A	265
266	80±3	20±3	UV FS	041-7980A	115	042-7980FA	145	045-7980A	265

DESIGNED FOR S- POLARIZATION. Laser Damage Threshold: >100 mJ/cm², 50 fsec pulse, 800 nm typical

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø12.7 × 3 mm		Ø25.4 × 3 mm		Ø50.8 × 8 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	20±3	80±3	UV FS	031-7420S	105	032-7420S	125	035-7420S	205
1030	30±3	70±3	UV FS	031-7430S	105	032-7430S	125	035-7430S	205
1030	50±3	50±3	UV FS	031-7450S	105	032-7450S	125	035-7450S	205
1030	70±3	30±3	UV FS	031-7470S	105	032-7470S	125	035-7470S	205
1030	80±3	20±3	UV FS	031-7480S	105	032-7480S	125	035-7480S	205
515	20±3	80±3	UV FS	031-7520S	103	032-7520S	123	035-7520S	200
515	30±3	70±3	UV FS	031-7530S	103	032-7530S	123	035-7530S	200
515	50±3	50±3	UV FS	031-7550S	103	032-7550S	123	035-7550S	200
515	70±3	30±3	UV FS	031-7570S	103	032-7570S	123	035-7570S	200
515	80±3	20±3	UV FS	031-7580S	103	032-7580S	123	035-7580S	200
343	20±3	80±3	UV FS	031-7620S	110	032-7620S	140	035-7620S	245
343	30±3	70±3	UV FS	031-7630S	110	032-7630S	140	035-7630S	245
343	50±3	50±3	UV FS	031-7650S	110	032-7650S	140	035-7650S	245
343	70±3	30±3	UV FS	031-7670S	110	032-7670S	140	035-7670S	245
343	80±3	20±3	UV FS	031-7680S	110	032-7680S	140	035-7680S	245
800	20±3	80±3	UV FS	041-7720S	105	042-7720S	125	045-7720S	205
800	30±3	70±3	UV FS	041-7730S	105	042-7730S	125	045-7730S	205
800	50±3	50±3	UV FS	041-7750S	105	042-7750S	125	045-7750S	205
800	70±3	30±3	UV FS	041-7770S	105	042-7770S	125	045-7770S	205
800	80±3	20±3	UV FS	041-7780S	105	042-7780S	125	045-7780S	205
400	20±3	80±3	UV FS	041-7820S	103	042-7820S	123	045-7820S	200
400	30±3	70±3	UV FS	041-7830S	103	042-7830S	123	045-7830S	200
400	50±3	50±3	UV FS	041-7850S	103	042-7850S	123	045-7850S	200
400	70±3	30±3	UV FS	041-7870S	103	042-7870S	123	045-7870S	200
400	80±3	20±3	UV FS	041-7880S	103	042-7880S	123	045-7880S	200
266	20±3	80±3	UV FS	041-7920S	115	042-7920FS	145	045-7920S	265
266	30±3	70±3	UV FS	041-7930S	115	042-7930FS	145	045-7930S	265
266	50±3	50±3	UV FS	041-7950S	115	042-7950FS	145	045-7950S	265
266	70±3	30±3	UV FS	041-7970S	115	042-7970FS	145	045-7970S	265
266	80±3	20±3	UV FS	041-7980S	115	042-7980FS	145	045-7980S	265

DESIGNED FOR P- POLARIZATION. Laser Damage Threshold: >100 mJ/cm², 50 fsec pulse, 800 nm typical

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø12.7 × 3 mm		Ø25.4 × 3 mm		Ø50.8 × 8 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	20±3	80±3	UV FS	031-7420P	105	032-7420P	125	035-7420P	205
1030	30±3	70±3	UV FS	031-7430P	105	032-7430P	125	035-7430P	205
1030	50±3	50±3	UV FS	031-7450P	105	032-7450P	125	035-7450P	205
1030	70±3	30±3	UV FS	031-7470P	105	032-7470P	125	035-7470P	205
1030	80±3	20±3	UV FS	031-7480P	105	032-7480P	125	035-7480P	205
515	20±3	80±3	UV FS	031-7520P	103	032-7520P	123	035-7520P	200
515	30±3	70±3	UV FS	031-7530P	103	032-7530P	123	035-7530P	200
515	50±3	50±3	UV FS	031-7550P	103	032-7550P	123	035-7550P	200
515	70±3	30±3	UV FS	031-7570P	103	032-7570P	123	035-7570P	200
515	80±3	20±3	UV FS	031-7580P	103	032-7580P	123	035-7580P	200
343	20±3	80±3	UV FS	031-7620P	110	032-7620P	140	035-7620P	245
343	30±3	70±3	UV FS	031-7630P	110	032-7630P	140	035-7630P	245
343	50±3	50±3	UV FS	031-7650P	110	032-7650P	140	035-7650P	245
343	70±3	30±3	UV FS	031-7670P	110	032-7670P	140	035-7670P	245
343	80±3	20±3	UV FS	031-7680P	110	032-7680P	140	035-7680P	245
800	20±3	80±3	UV FS	041-7720P	105	042-7720P	125	045-7720P	205
800	30±3	70±3	UV FS	041-7730P	105	042-7730P	125	045-7730P	205
800	50±3	50±3	UV FS	041-7750P	105	042-7750P	125	045-7750P	205
800	70±3	30±3	UV FS	041-7770P	105	042-7770P	125	045-7770P	205
800	80±3	20±3	UV FS	041-7780P	105	042-7780P	125	045-7780P	205
400	20±3	80±3	UV FS	041-7820P	103	042-7820P	123	045-7820P	200
400	30±3	70±3	UV FS	041-7830P	103	042-7830P	123	045-7830P	200
400	50±3	50±3	UV FS	041-7850P	103	042-7850P	123	045-7850P	200
400	70±3	30±3	UV FS	041-7870P	103	042-7870P	123	045-7870P	200
400	80±3	20±3	UV FS	041-7880P	103	042-7880P	123	045-7880P	200
266	20±3	80±3	UV FS	041-7920P	115	042-7920FP	145	045-7920P	265
266	30±3	70±3	UV FS	041-7930P	115	042-7930FP	145	045-7930P	265
266	50±3	50±3	UV FS	041-7950P	115	042-7950FP	145	045-7950P	265
266	70±3	30±3	UV FS	041-7970P	115	042-7970FP	145	045-7970P	265
266	80±3	20±3	UV FS	041-7980P	115	042-7980FP	145	045-7980P	265

BROADBAND LASER BEAMSPLITTERS

DESIGNED FOR S- POLARIZATION. Laser Damage Threshold: >50 mJ/cm², 50 fsec pulse, 800 nm typical

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø25.4 × 3 mm		Ø50.8 × 6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
720 – 880	8±1	92±1	UV FS	042-7708SB	110	045-7708SB	185
720 – 880	20±5	80±5	UV FS	042-7720SB	185	045-7720SB	340
720 – 880	30±5	70±5	UV FS	042-7730SB	185	045-7730SB	340
720 – 880	40±5	60±5	UV FS	042-7740SB	185	045-7740SB	340
720 – 880	50±5	50±5	UV FS	042-7750SB	185	045-7750SB	340
720 – 880	60±5	40±5	UV FS	042-7760SB	190	045-7760SB	360
720 – 880	70±5	30±5	UV FS	042-7770SB	195	045-7770SB	390
720 – 880	80±5	20±5	UV FS	042-7780SB	195	045-7780SB	390
720 – 880	90±3	10±3	UV FS	042-7790SB	215	045-7790SB	440
720 – 880	95±2	5±2	UV FS	042-7795SB	225	045-7795SB	470

DESIGNED FOR P- POLARIZATION. Laser Damage Threshold: >50 mJ/cm², 50 fsec pulse, 800 nm typical

Wavelength, nm	Reflection, %	Transmission, %	Substrate material	Ø25.4 × 3 mm		Ø50.8 × 6 mm	
				Catalogue number	Price, EUR	Catalogue number	Price, EUR
750 – 850	10±2	90±2	UV FS	042-7708PB	185	045-7708PB	340
750 – 850	20±5	80±5	UV FS	042-7720PB	185	045-7720PB	340
750 – 850	25±5	75±5	UV FS	042-7725PB	185	045-7725PB	340
750 – 850	30±5	70±5	UV FS	042-7730PB	185	045-7730PB	340
750 – 850	40±5	60±5	UV FS	042-7740PB	185	045-7740PB	340
750 – 850	50±5	50±5	UV FS	042-7750PB	185	045-7750PB	340
750 – 850	60±5	40±5	UV FS	042-7760PB	190	045-7760PB	360
750 – 850	70±5	30±5	UV FS	042-7770PB	195	045-7770PB	390
750 – 850	75±5	25±5	UV FS	042-7775PB	195	045-7775PB	390
750 – 850	80±5	20±5	UV FS	042-7780PB	195	045-7780PB	390
750 – 850	90±3	10±3	UV FS	042-7790PB	215	045-7790PB	440
750 – 850	95±2	5±2	UV FS	042-7795PB	225	045-7795PB	470

RELATED PRODUCTS

Uncoated Elliptical Mirrors

See page 1.10

Kinematic Mirror and Beamsplitter Mount 840-0030-02

Find more at EksmaOptics.com



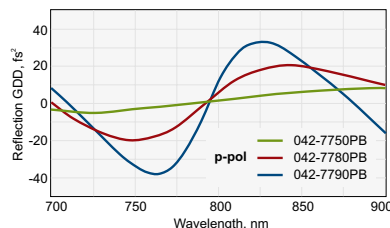
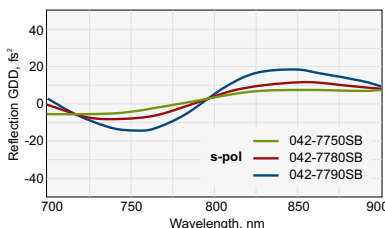
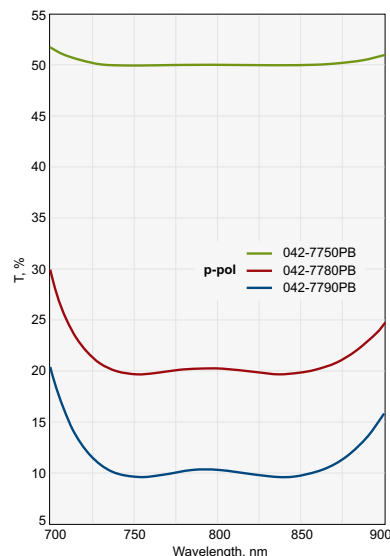
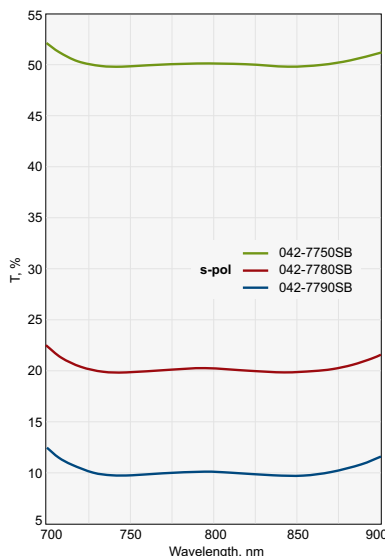
Adapter for Beamsplitter at 45° 840-0116

Find more at EksmaOptics.com



Flipping Mirror / Beamsplitter Mount 840-0155

Find more at EksmaOptics.com



042-7750SB. Rs=50±5% @ 720–880 nm, AOI=45°
042-7780SB. Rp=80±5% @ 720–880 nm, AOI=45°
042-7790SB. Rp=90±3% @ 720–880 nm, AOI=45°

042-7750PB. Rp=50±5% @ 750–850 nm, AOI=45°
042-7780PB. Rp=80±5% @ 750–850 nm, AOI=45°
042-7790PB. Rp=90±3% @ 750–850 nm, AOI=45°

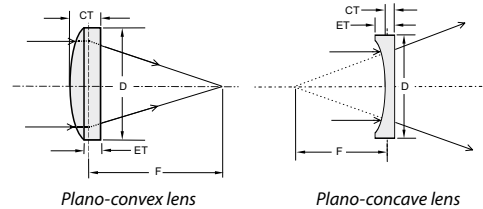
THIN LENSES

FEATURES

- Very thin: edge thickness varies from 0.5~1.9 mm
- Centre thickness varies from 1~3 mm
- Plano-Convex or Plano-Concave type
- Uncoated,
 - AR coated @ 333-353 nm, AR coated @ 380-420 nm,
 - AR coated @ 500-530 nm, AR coated @ 515+1030 nm,
 - AR coated @ 760-840 nm, AR coated @ 1000-1060 nm,
 - BBAR @ 700-900 nm, UBBAR @ 350-900 nm

SPECIFICATIONS

Material	UV FS
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Clear aperture	90% of the diameter
Diameter tolerance	+0.00; -0.12 mm
Thickness tolerance	±0.2 mm
Surface irregularity	$\lambda/8$ @ 633 nm
Concentricity	3 arcmin
Paraxial focal length	±2% @ 800 nm



THIN PLANO-CONVEX LENSES, Ø12.7 mm

UNCOATED LENSES. Material – UVFS. Diameter D = Ø12.7 mm

Focal Length, mm @ 800 nm	Centre Thickness CT, mm	Edge Thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
30	2.5	1.0	13.6	110-1106ET	60
40	1.8	0.7	18.1	110-1108ET	60
50	1.9	1.0	22.7	110-1109ET	60
75	1.8	1.2	34.0	110-1111ET	60
100	1.5	0.9	45.3	110-1115ET	60
125	1.4	1.0	56.7	110-1117ET	60
150	1.5	1.2	68.0	110-1119ET	60
175	1.2	1.0	79.3	110-1121ET	60
200	1.2	1.0	90.7	110-1123ET	60
250	1.1	1.0	113.3	110-1126ET	60
300	1.1	1.0	136.0	110-1129ET	60
400	1.1	1.0	181.3	110-1133ET	60
450	1.1	1.0	204.0	110-1135ET	60
500	1.1	1.0	226.7	110-1137ET	60

THIN PLANO-CONVEX LENSES, Ø50.8 mm

UNCOATED LENSES. Material – UVFS. Diameter D = Ø50.8 mm

Focal Length, mm @ 800 nm	Centre Thickness CT, mm	Edge Thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
75	14	2.5	34.0	110-1505ET	180
100	10.3	2.5	45.3	110-1509ET	180
150	7.4	2.5	68.0	110-1511ET	180
200	6.1	2.5	90.7	110-1515ET	180
300	4.9	2.5	136.0	110-1519ET	180
400	4.3	2.5	181.3	110-1523ET	180
500	3.9	2.5	226.7	110-1527ET	180
1000	3.2	2.5	453.3	110-1545ET	180
1500	3	2.5	680.0	110-1550ET	180
2000	2.9	2.5	906.6	110-1555ET	180
3000	2.7	2.5	1360.0	110-1566ET	180
4000	2.7	2.5	1813.3	110-1568ET	180
5000	2.6	2.5	2266.6	110-1567ET	180
6000	2.6	2.5	2719.9	110-1570ET	180

THIN PLANO-CONVEX LENSES, Ø25.4 mm

UNCOATED LENSES. Material – UVFS. Diameter D = Ø25.4 mm

Focal Length, mm @ 800 nm	Centre Thickness CT, mm	Edge Thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
50	4.9	1.0	22.7	110-1205ET	80
75	3	0.5	34.0	110-1209ET	80
100	2.5	0.7	45.3	110-1211ET	80
125	2	0.6	56.7	110-1216ET	80
150	2	0.8	68.0	110-1217ET	80
200	2	1.1	90.7	110-1219ET	80
300	2	1.4	136.0	110-1223ET	80
350	2	1.5	158.7	110-1225ET	80
400	2	1.6	181.3	110-1227ET	80
450	2	1.6	204.0	110-1231ET	80
500	2	1.6	226.7	110-1233ET	80
1000	1.5	1.3	453.3	110-1245ET	80
1500	1.4	1.3	680.0	110-1255ET	80
2000	1.4	1.3	906.6	110-1265ET	80

THIN PLANO-CONCAVE LENSES, Ø12.7 mm

UNCOATED LENSES. Material – UVFS. Diameter D = Ø12.7 mm

Focal Length, mm @ 800 nm	Centre Thickness CT, mm	Edge Thickness ET, mm	Radius, mm	Catalogue number	Price, EUR
-20	1	3.5	-9.1	112-1104ET	60
-30	1	2.5	-13.6	112-1106ET	60
-40	1	2.1	-18.1	112-1108ET	60
-50	1	1.9	-22.7	112-1109ET	60
-60	1	1.7	-27.2	112-1110ET	60
-75	1	1.5	-34.0	112-1112ET	60
-80	1	1.5	-36.3	112-1113ET	60
-100	1	1.4	-45.3	112-1115ET	60
-125	1	1.3	-56.7	112-1117ET	60
-150	1	1.2	-68.0	112-1119ET	60

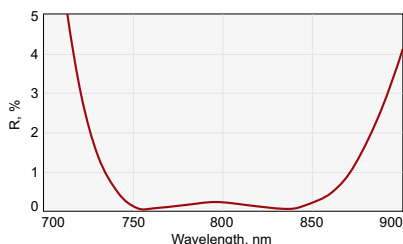
AVAILABLE STANDARD COATINGS FOR THIN LENSES

SPECIFICATIONS

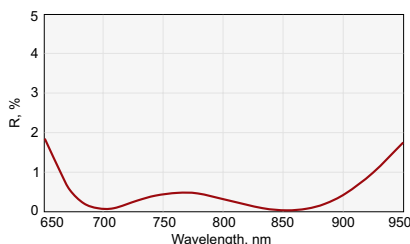
Technology	Electron beam multilayer dielectric
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Angle of Incidence	0°
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture

AVAILABLE COATINGS

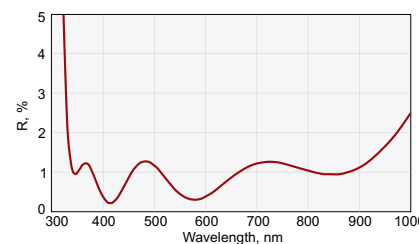
Wavelength	Reflection per surface	Laser Damage Threshold	Coating suffix	Price per unit to be added, EUR/pc.
760 – 840 nm	$R < 0.5\%$	100 mJ/cm ²	AR	29
700 – 900 nm	$R < 0.5\%$	50 mJ/cm ²	BBAR	50
350 – 900 nm	$R < 1.5\%$	50 mJ/cm ²	UBBAR	60
1000 – 1060 nm	$R < 0.3\%$	100 mJ/cm ²	AR1030	29
500 – 530 nm	$R < 0.4\%$	100 mJ/cm ²	AR515	29
380 – 420 nm	$R < 0.5\%$	100 mJ/cm ²	AR400	29
333 – 353 nm	$R < 0.5\%$	100 mJ/cm ²	AR343	29
515 + 1030 nm	$R < 0.5\%$	100 mJ/cm ²	ARD	35



Reflectivity @ 760-840 nm



Reflectivity @ 700-900 nm



Reflectivity @ 350-900 nm

AVAILABLE IBS COATINGS FOR THIN LENSES

SPECIFICATIONS

Technology	Ion Beam Sputtering (IBS)
Adhesion and Durability	Per MIL-C-675A. Insoluble in lab solvents
Clear Aperture	Exceeds central 85% of diameter
Angle of Incidence	0°
Coated Surface Flatness	$\lambda/10$ at 633 nm over clear aperture

AVAILABLE COATINGS

Wavelength	Reflection per surface	Laser Damage Threshold	Coating suffix	Price per unit to be added, EUR/pc.
760 – 840 nm	$R < 0.1\%$	100 mJ/cm ²	AR800HT	105
700 – 900 nm	$R < 0.1\%$	100 mJ/cm ²	ARB800HT	115
380 – 420 nm	$R < 0.2\%$	50 mJ/cm ²	AR400HT	105
400 + 800 nm	$R < 0.2\%$	50 mJ/cm ²	ARD800HT	115
1000 – 1060 nm	$R < 0.1\%$	100 mJ/cm ²	AR1030HT	105
500 – 530 nm	$R < 0.1\%$	50 mJ/cm ²	AR515HT	105
333 – 353 nm	$R < 0.2\%$	25 mJ/cm ²	AR343HT	135
515 + 1030 nm	$R < 0.1\%$	50 mJ/cm ²	ARD1030HT	115

Ordering of Coated Thin Lenses

Please choose the coating and add its suffix to the lens code.

Example:

UVFS Thin Plano-Convex Lens, focal length 75 mm, coated AR / AR @ 760-840 nm

Code: **110-1209ET** + **AR**, Price: 80 + 29 EUR= 109 EUR/pc.

Lens code

Coating code

Lens price

Coating price

AR COATED LENS KITS



Large Spherical Lens Kit

Lens kits contain different types of spherical (plano-convex, biconvex, plano-concave, biconcave) or cylindrical (plano-convex, plano-concave) lenses with various focal lengths. Kits are packed into foam lined plastic boxes for safe handling and storage. Kits are available with laser line and broadband multilayer anti-reflection coatings.

Spherical lens kits consist of 40 (large kit) or 15 (small kit) Ø25.4 mm lenses made of UVFS.

Cylindrical lens kits consist of 12 rectangular lenses (25.4 × 50.8 mm) made of UVFS.

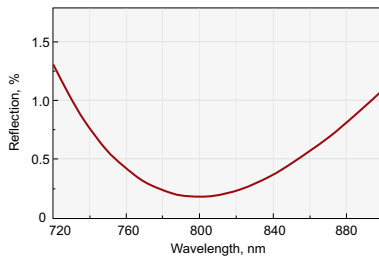
LARGE UV FS SPHERICAL LENS KIT (40 pcs.)

Coating	Catalogue number	Price, EUR
BBAR @ 210 – 400 nm, R<2%	140-1240-AR210-400	3490
BBAR @ 350 – 900 nm, R<1.5%	140-1240-AR350-900	3290
BBAR @ 760 – 840 nm, R<0.4%	140-1240-AR760-840	3040
BBAR @ 700 – 900 nm, R<0.8%	140-1240-AR700-900	3210
BBAR @ 650 – 1100 nm, R<1%	140-1240-AR650-1100	3310
AR @ 266 nm, R<0.4%	140-1240-AR266	3130
AR @ 1030 nm, R<0.25%	140-1240-AR1030	2930
AR @ 515 nm, R<0.25%	140-1240-AR515	2930
AR @ 343 nm, R<0.3%	140-1240-AR343	3030
AR @ 258 nm, R<0.4%	140-1240-AR258	3130

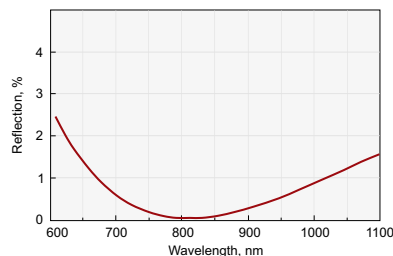
Large UV FS Spherical Lens Kit

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	30	110-1203E
pl/cx	25.4	50	110-1205E
pl/cx	25.4	75	110-1209E
pl/cx	25.4	80	110-1210E
pl/cx	25.4	100	110-1211E
pl/cx	25.4	125	110-1216E
pl/cx	25.4	150	110-1217E
pl/cx	25.4	200	110-1219E
pl/cx	25.4	250	110-1221E
pl/cx	25.4	300	110-1223E
pl/cx	25.4	350	110-1225E
pl/cx	25.4	400	110-1227E
pl/cx	25.4	500	110-1233E
pl/cx	25.4	600	110-1235E
pl/cx	25.4	750	110-1239E
pl/cx	25.4	1000	110-1245E
bi/cx	25.4	25	111-1204E
bi/cx	25.4	40	111-1207E
bi/cx	25.4	50	111-1210E
bi/cx	25.4	75	111-1214E

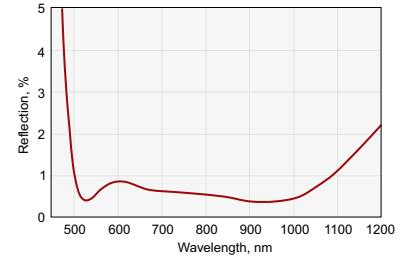
Type	Dia, mm	F, mm	Catalogue number
bi/cx	25.4	100	111-1218E
bi/cx	25.4	150	111-1222E
bi/cx	25.4	200	111-1226E
bi/cx	25.4	250	111-1230E
bi/cx	25.4	300	111-1234E
bi/cx	25.4	400	111-1238E
bi/cx	25.4	500	111-1240E
bi/cx	25.4	1000	111-1260E
pl/cv	25.4	-50	112-1205E
pl/cv	25.4	-75	112-1209E
pl/cv	25.4	-100	112-1211E
pl/cv	25.4	-150	112-1217E
pl/cv	25.4	-200	112-1219E
pl/cv	25.4	-300	112-1223E
bi/cv	25.4	-25	114-1204E
bi/cv	25.4	-50	114-1208E
bi/cv	25.4	-75	114-1212E
bi/cv	25.4	-100	114-1216E
bi/cv	25.4	-150	114-1220E
bi/cv	25.4	-200	114-1224E



$R<0.5\%$ @ 760-840 nm, AOI=0°



$R<0.8\%$ @ 700-900 nm, AOI=0°



$R<1.5\%$ @ 500-1100 nm, AOI=0°

SMALL UV FS SPHERICAL LENS KIT (15 pcs.)

Coating	Code	Price, EUR
BBAR @ 210 – 400 nm, R<2%	140-1215-AR210-400	1830
BBAR @ 350 – 900 nm, R<1.5%	140-1215-AR350-900	1660
BBAR @ 760 – 840 nm, R<0.4%	140-1215-AR760-840	1530
BBAR @ 700 – 900 nm, R<0.8%	140-1215-AR700-900	1610
BBAR @ 650 – 1100 nm, R<1%	140-1215-AR650-1100	1670
AR @ 266 nm, R<0.4%	140-1215-AR266	1380
AR @ 1030 nm, R<0.25%	140-1215-AR1030	1320
AR @ 515 nm, R<0.25%	140-1215-AR515	1320
AR @ 343 nm, R<0.3%	140-1215-AR343	1350
AR @ 258 nm, R<0.4%	140-1215-AR258	1380

Small UV FS Spherical Lens Kit

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	30	110-1203E
pl/cx	25.4	50	110-1205E
pl/cx	25.4	75	110-1209E
pl/cx	25.4	100	110-1211E
pl/cx	25.4	125	110-1216E
pl/cx	25.4	150	110-1217E
pl/cx	25.4	200	110-1219E
pl/cx	25.4	300	110-1223E

Type	Dia, mm	F, mm	Catalogue number
pl/cx	25.4	500	110-1233E
pl/cx	25.4	1000	110-1245E
pl/cv	25.4	-50	112-1205E
pl/cv	25.4	-75	112-1209E
pl/cv	25.4	-100	112-1211E
pl/cv	25.4	-125	112-1215E
pl/cv	25.4	-150	112-1217E

UV FS CYLINDRICAL LENS KIT (12 pcs.)

Coating	Catalogue number	Price, EUR
AR @ 210 – 400nm, R<2%	140-0212-ARB300	2720
AR @ 350 – 900nm, R<1.5%	140-0212-ARB625	2630
AR @ 515 + 1030nm, R<0.5%	140-0212-ARD1030	2370
AR @ 700 – 900nm, R<0.5%	140-0212-ARB800	2500
AR @ 650 – 1100nm, R<0.7%	140-0212-ARB825	2550
AR @ 1000 – 1060nm, R<0.3%	140-0212-AR1030	2300
AR @ 515 + 1030nm, R<0.1%	140-0212-ARD1030HT	3300
AR @ 700 – 900nm, R<0.1%	140-0212-ARB800HT	3400
AR @ 900 – 1100nm, R<0.1%	140-0212-ARB1000HT	3400

UV FS Cylindrical Lens Kit

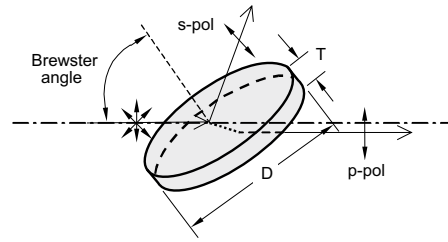
Type	Size, mm	F, mm	Catalogue number
pl/cx	25.4 × 50.8	50	120-1205E
pl/cx	25.4 × 50.8	75	120-1210E
pl/cx	25.4 × 50.8	100	120-1215E
pl/cx	25.4 × 50.8	150	120-1220E
pl/cx	25.4 × 50.8	200	120-1225E
pl/cx	25.4 × 50.8	300	120-1230E

Type	Size, mm	F, mm	Catalogue number
pl/cx	25.4 × 50.8	500	120-1235E
pl/cx	25.4 × 50.8	1000	120-1240E
pl/cv	25.4 × 50.8	-50	122-1205E
pl/cv	25.4 × 50.8	-75	122-1210E
pl/cv	25.4 × 50.8	-100	122-1215E
pl/cv	25.4 × 50.8	-150	122-1220E

THIN FILM POLARIZERS (56° Angle of Incidence)

Thin film polarizers separate s- and p- polarization components. Due to their high laser damage threshold, thin film polarizers can be used as an alternative to Glan-Taylor laser polarizing prisms or cube polarizing beamsplitters.

Femtoline thin film laser polarizers are designed for use in high energy lasers. They can be used for Yb:KYW/KGW or Ti:Sapphire laser fundamental wavelengths or their harmonics, as well as intracavity Q-switch hold-off polarizers. The most efficient way to use these polarizers is at Brewster's angle – $56 \pm 2^\circ$.



SPECIFICATIONS

Material	BK7, UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Angle of incidence (AOI)	$56 \pm 2^\circ$
Laser damage threshold	$>100 \text{ mJ/cm}^2$, 50 fsec pulse, 50 Hz, 800 nm typical

THIN FILM POLARIZERS WITH HIGH EXTINCTION RATIO

ROUND POLARIZERS. Material – UV FS. $T_p > 98\%$, $T_s < 0.1\%$.
Extinction ratio for transmitted light $T_p/T_s > 1000:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3	420-1242HE	218
515	25.4	3	420-1244HE	185
800	25.4	3	420-1256HE	185
780 – 820	25.4	3	420-1266HE	275
1030	25.4	3	420-1248HE	216

RECTANGULAR POLARIZERS. Material – UV FS. $T_p > 98\%$, $T_s < 0.1\%$.
Extinction ratio for transmitted light $T_p/T_s > 1000:1$

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
1030	20	15	6	420-1478HE	165
1030	30	20	6	420-1578HE	220

HIGH TRANSMISSION THIN FILM POLARIZERS

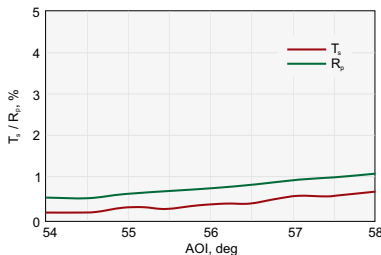
ROUND POLARIZERS. Material – UV FS. $R_s / R_p > 99.5 / 99.0\%$.
Extinction ratio for transmitted light $T_p/T_s > 200:1$

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3.0	420-1242HT	237
515	25.4	3.0	420-1244HT	200
800	25.4	3.0	420-1256HT	200
1030	25.4	3.0	420-1248HT	234

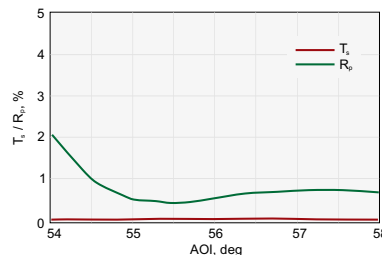
ULTRA HIGH TRANSMISSION THIN FILM POLARIZERS

ROUND POLARIZERS. Material – UV FS. $T_s < 0.2\%$, $R_p < 0.2\%$.
Extinction ratio for transmitted light $T_p/T_s > 500:1$

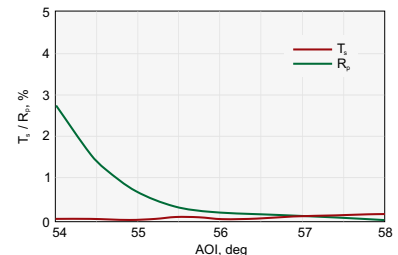
Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
800	25.4	3.0	420-1256UHT	260
1030	25.4	3.0	420-1248UHT	304



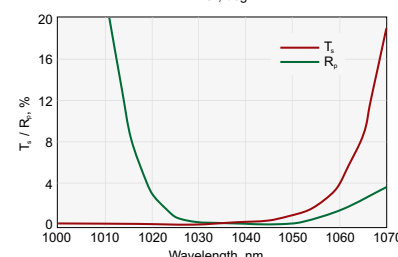
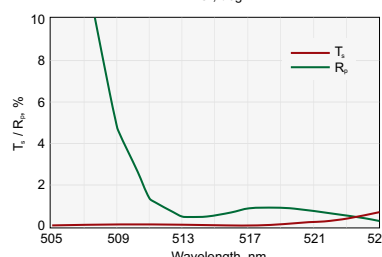
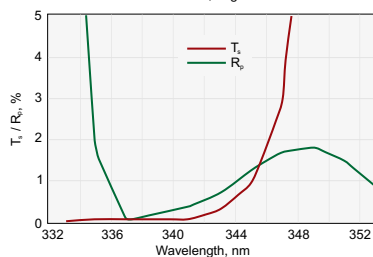
420-1242HT.
High Transmission @ 343 nm,
 $R_s/T_p > 99.5/99.0\%$, AOI=56°



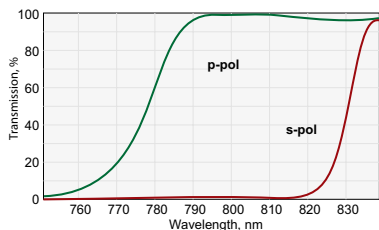
420-1244HT.
High Transmission @ 515 nm,
 $R_s/T_p > 99.5/99.0\%$, AOI=56°



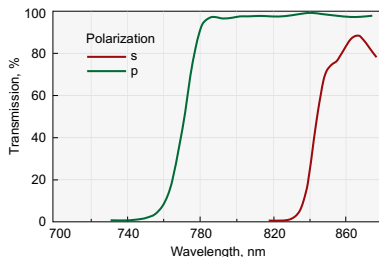
420-1248HT.
High Transmission @ 1030 nm,
 $R_s/T_p > 99.5/99.0\%$, AOI=56°



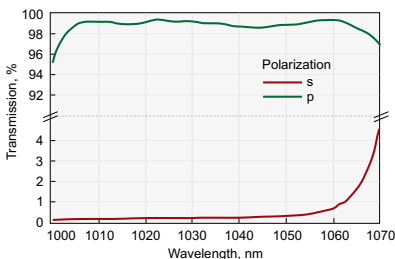
STANDARD THIN FILM POLARIZERS



420-0126E.
Transmission @ 800 nm,
Rs/Tp > 99.5/95.0 %, AOI=56°



420-0266E.
Transmission @ 780-820 nm,
Rs/Tp > 99.5/95.0 %, AOI=56°



420-0268E.
Transmission @ 1010-1050 nm,
Rs/Tp > 99.5/95.0 %, AOI=56°

Please contact us if you need thin film laser polarizers of other wavelengths or other types of substrates.

RELATED PRODUCTS

Glan Laser Polarizing, Wollaston Prisms
See page 1.63

Adapters for Polarizer
at 56° 840-0117, 840-0118
Find more at EksmaOptics.com



Variable Attenuators
for Linearly Polarized
Laser Beam 990-0070
See page 4.29



ROUND POLARIZERS. Material – BK7. Rs / Tp > 99.5 / 95.0%.
Extinction ratio for transmitted light Tp/Ts >200:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
515	12.7	3.0	420-0114E	108
800	12.7	3.0	420-0126E	108
780-820	12.7	3.0	420-0136E	160
1030	12.7	3.0	420-0118E	115
1010-1050	12.7	3.0	420-0138E	160
515	25.4	3.0	420-0244E	128
800	25.4	3.0	420-0256E	128
780-820	25.4	3.0	420-0266E	189
1030	25.4	3.0	420-0248E	155
1010-1050	25.4	3.0	420-0268E	189
515	50.8	6.0	420-0514E	206
800	50.8	6.0	420-0506E	215
780-820	50.8	6.0	420-0526E	309
1030	50.8	6.0	420-0518E	255
1010-1050	50.8	6.0	420-0528E	335

RECTANGULAR POLARIZERS. Material – BK7. Rs / Tp > 99.5 / 95.0%.
Extinction ratio for transmitted light Tp/Ts >200:1

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
515	28.6	14.3	3.0	420-0274	142
800	28.6	14.3	3.0	420-0286	142
780-820	28.6	14.3	3.0	420-0296	220
1030	28.6	14.3	3.0	420-0278	170
1010-1050	28.6	14.3	3.0	420-0298	220

ROUND POLARIZERS. Material – UV FS. Rs / Tp > 99.5 / 95.0%.
Extinction ratio for transmitted light Tp/Ts >200:1

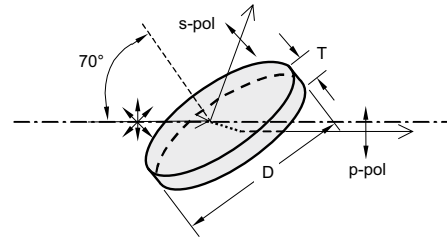
Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	12.7	3.0	420-1112E	164
400	12.7	3.0	420-1123E	131
515	12.7	3.0	420-1114E	131
800	12.7	3.0	420-1126E	131
780-820	12.7	3.0	420-1136E	196
1030	12.7	3.0	420-1118E	145
1010-1050	12.7	3.0	420-1138E	196
343	25.4	3.0	420-1242E	182
400	25.4	3.0	420-1253E	154
515	25.4	3.0	420-1244E	154
800	25.4	3.0	420-1256E	154
780-820	25.4	3.0	420-1266E	231
1030	25.4	3.0	420-1248E	180
1010-1050	25.4	3.0	420-1268E	231
343	50.8	6.0	420-1512E	325
400	50.8	6.0	420-1503E	295
515	50.8	6.0	420-1514E	295
800	50.8	6.0	420-1506E	305
780-820	50.8	6.0	420-1526E	404
1030	50.8	6.0	420-1518E	315
1010-1050	50.8	6.0	420-1528E	404

RECTANGULAR POLARIZERS. Material – UV FS. Rs / Tp > 99.5 / 95.0%.
Extinction ratio for transmitted light Tp/Ts >2 00:1

Wavelength, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
	Length, mm	Width, mm			
343	28.6	14.3	3.0	420-1272	255
400	28.6	14.3	3.0	420-1283	215
515	28.6	14.3	3.0	420-1274	215
800	28.6	14.3	3.0	420-1286	215
780-820	28.6	14.3	3.0	420-1296	315
1030	28.6	14.3	3.0	420-1278	225
1010-1050	28.6	14.3	3.0	420-1298	315

THIN FILM POLARIZERS (70° Angle of Incidence)

Broadband thin film polarizers separate the s- and p-polarization components in broad region at 70° angle of incidence (AOI). These polarizers are designed to be used in high energy laser systems, typically as extracavity attenuators for femtosecond lasers. Polarizers are made from UV fused silica and feature a high laser damage threshold – up to 50 mJ/cm², 50 fsec pulse, 50 Hz, 800 nm typical.



SPECIFICATIONS

Substrate material	UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	>90% of diameter
Angle of incidence (AOI)	$70 \pm 2^\circ$
Parallelism	<30 arcsec

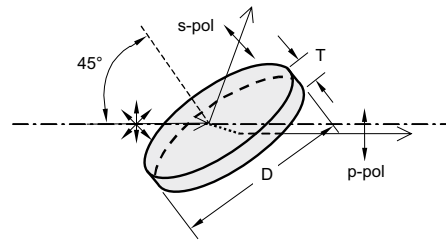
RECTANGULAR POLARIZERS. Material – UV FS. Rs / Tp > 99.5 / 95.0%.

Extinction ratio for transmitted light Tp/Ts >200:1

Centre wavelength, nm	Operating wavelength region, nm	Rectangular dimensions		Thickness T, mm	Catalogue number	Price, EUR
		Length, mm	Width, mm			
800	750 – 850	60.0	20.0	4.0	420-1696BBi70	435
1030	980 – 1080	60.0	20.0	4.0	420-1698BBi70	435

THIN FILM POLARIZERS (45° Angle of Incidence)

These thin film polarizers separate or combine the s- and p-polarization components at 45° angle of incidence. They are designed for use in high energy lasers. Polarizers are made from UV FS and feature high laser damage threshold reaching 10 J/cm² at 1064 nm.



SPECIFICATIONS

Substrate material	UV FS
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Transmitted wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	>90% of diameter
Angle of incidence (AOI)	$45 \pm 2^\circ$
Parallelism	<30 arcsec

TF POLARIZERS WITH HIGH EXTINCTION RATIO

ROUND POLARIZERS. Material – UV FS. Tp > 98%, Ts < 0.1%.

Extinction ratio for transmitted light Tp/Ts: >1000:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3	420-1242i45HE	328
515	25.4	3	420-1244i45HE	295
1030	25.4	3	420-1248i45HE	315
343	50.8	6	420-1512i45HE	640
515	50.8	6	420-1514i45HE	555
1030	50.8	6	420-1518i45HE	620

STANDARD THIN FILM POLARIZERS

ROUND POLARIZERS. Material – UV FS. Rs / Tp > 99.5 / 95.0%.

Extinction ratio for transmitted light Tp/Ts >200:1

Wavelength, nm	Diameter D, mm	Thickness T, mm	Catalogue number	Price, EUR
343	25.4	3	420-1242i45	238
515	25.4	3	420-1244i45	200
1030	25.4	3	420-1248i45	225
343	50.8	6	420-1512i45	455
515	50.8	6	420-1514i45	395
1030	50.8	6	420-1518i45	440

QUARTZ RETARDATION WAVEPLATES

Quartz Retardation Plates are made of material enabling linear birefringence. These plates are made of high quality optical grade crystalline quartz, featuring high damage threshold. Retardation

plates rotate polarization's direction ($\lambda/2$) or convert linear into circular polarization or vice versa ($\lambda/4$). Quartz retardation plates are supplied mounted and AR coated.

ZERO ORDER OPTICALLY CONTACTED WAVEPLATES

FEATURES

- › Easily aligned
- › Temperature insensitive
- › Moderately insensitive to wavelength

Zero order plates are comprised of two different plates cut parallel to their optical axis. This construction makes plates less dependent on temperature. The plates are polished to different thicknesses enabling one to achieve required retardation difference. These component plates have orthogonal optic axis directions, so that the roles of the ordinary and extraordinary rays are interchanged in passing from one plate to another. The thickness of the plate determines the phase shift between the ordinary and extraordinary beams for any specific wavelength.



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Laser damage threshold	> 10 mJ/cm ² , 50 fsec pulse, 800 nm typical

Ø12.7 mm waveplates. Clear aperture Ø11 mm, unmounted

Center wavelength, nm	AR coating range, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	1000-1060	460-4208D12	165	460-4408D12	165
800	760-840	460-4215D12	165	460-4415D12	165
780	740-820	460-4220D12	165	460-4420D12	165
515	500-530	460-4232D12	165	460-4432D12	165
400	380-420	460-4235D12	165	460-4435D12	165
343	333-353	460-4241D12	175	460-4441D12	175
266	257-275	460-4245D12	185	460-4445D12	185
257	250-265	460-4246D12	185	460-4446D12	185

RELATED PRODUCTS

Achromatic Air-Spaced Waveplates

See page 1.68

Polarizer Holder 840-0180

Find more at [EksmaOptics.com](#)



High Precision Rotation Polarizer, Waveplate Mount 840-0186

Find more at [EksmaOptics.com](#)



Ø20 mm waveplates. Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Center wavelength, nm	AR coating range, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	1000-1060	460-4208	245	460-4408	245
800	760-840	460-4215	245	460-4415	245
780	740-820	460-4220	245	460-4420	245
515	500-530	460-4232	245	460-4432	245
400	380-420	460-4235	245	460-4435	245
343	333-353	460-4241	270	460-4441	270
266	257-275	460-4245	280	460-4445	280
257	250-265	460-4246	280	460-4446	280

ZERO ORDER AIR-SPACED WAVEPLATES

FEATURES

- For high power laser applications



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Wavefront distortion	$\lambda/10$ @ 633 nm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Laser damage threshold	100 mJ/cm ² , 50 fsec pulse, 800 nm typical

HOUSING ACCESSORIES

Polarizer Holder 840-0180

Find more at EksmaOptics.com



Center wavelength, nm	AR coating range, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
		Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	1000-1060	464-4208	310	464-4408	310
800	760-840	464-4215	310	464-4415	310
780	740-820	464-4220	310	464-4420	310
515	500-530	464-4232	310	464-4432	310
400	380-420	464-4235	310	464-4435	310
343	333-353	464-4241	335	464-4441	335
266	257-275	464-4245	345	464-4445	345
257	250-265	464-4246	345	464-4446	345

ZERO ORDER DUAL WAVELENGTH WAVEPLATES

When optical axis is turned by 45 degrees to input polarization, the waveplate rotates polarization of Ti:Sapphire laser fundamental (800 nm) by 90 degrees and the polarization of Ti:Sapphire second harmonic (400 nm) remains the same.

SPECIFICATIONS

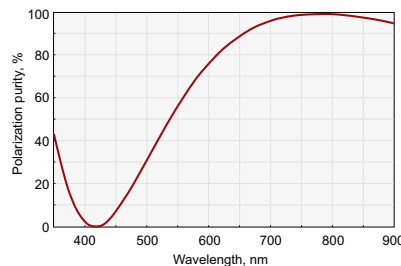
Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0/-0.12 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	<10 arcsec
AR coating	R<0.5%

Description	AR coated	Laser Damage Threshold	Application	Catalogue number	Price, EUR
optically contacted $\lambda/2$ @800 nm + λ @400 nm	800+400 nm	>10 mJ/cm ² , 50 fsec pulse, 800 nm typical	Ti:Sapphire	465-4211	345
air-spaced $\lambda/2$ @800 nm + λ @400 nm	800+400 nm	100 mJ/cm ² , 50 fsec pulse, 800 nm typical	Ti:Sapphire	466-4211	410
optically contacted $\lambda/2$ @1030 nm + λ @515 nm	1030+515 nm	>10 mJ/cm ² , 50 fsec pulse, 1030 nm typical	Yb:KGW/KYW	465-4212	345
air-spaced $\lambda/2$ @1030 nm + λ @515 nm	1030+515 nm	100 mJ/cm ² , 50 fsec pulse, 1030 nm typical	Yb:KGW/KYW	466-4212	410

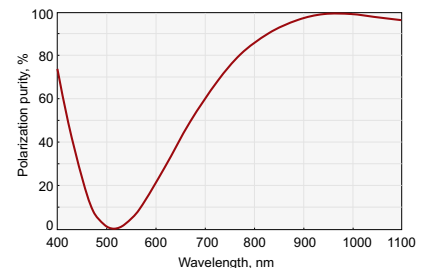
HOUSING ACCESSORIES

Polarizer Holder 840-0180

Find more at EksmaOptics.com



Polarization purity of zero order dual waveplate.
 $\lambda/2$ @800 nm + λ @400 nm



Polarization purity of zero order dual waveplate.
 $\lambda/2$ @1030 nm + λ @515 nm

LOW ORDER WAVEPLATES

FEATURES

- › Thinner than multiple order

Low order plates are less temperature sensitive and temperature dependent than multiple order plates. These plates are suitable for high and low power applications.

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Laser damage threshold	100 mJ/cm ² , 50 fsec pulse, 800 nm typical

Ø12.7 mm waveplates. Clear aperture Ø11 mm, unmounted

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	461-4208D12	105	461-4408D12	105
800	461-4215D12	105	461-4415D12	105
780	461-4220D12	105	461-4420D12	105
515	461-4232D12	105	461-4432D12	105

RELATED PRODUCTS

Low Order Plates of other wavelengths

See page 1.69

High Precision Rotation
Polarizer, Waveplate
Mount 840-0186

Find more at EksmaOptics.com



Ø20 mm waveplates. Clear aperture Ø17 mm, mounted into Ø25.4 mm ring holder

Wavelength, nm	Retardation $\lambda/2$		Retardation $\lambda/4$	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
1030	461-4208	160	461-4408	160
800	461-4215	160	461-4415	160
780	461-4220	160	461-4420	160
515	461-4232	160	461-4432	160
400	461-4235	160	461-4435	160
343	461-4241	192	461-4441	192

MULTIPLE ORDER DUAL WAVELENGTH WAVEPLATES

SPECIFICATIONS

Material	Single crystal quartz
Optical axis	normal to facet on circumference of retarder
Wavefront distortion	$\lambda/10$ @ 633 nm
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Nominal thickness of waveplate	0.2 – 1.2 mm
Laser damage threshold	>100 mJ/cm ² , 50 fsec pulse, 800 nm typical

RELATED PRODUCTS

Dual Wavelength Plates of other wavelengths

See page 1.71

High Precision Rotation
Polarizer, Waveplate
Mount 840-0186

Find more at EksmaOptics.com



Retardation and Wavelength	Catalogue number	Price, EUR
λ @ 800 nm + $\lambda/2$ @ 400 nm	463-4121	215
λ @ 800 nm + $\lambda/4$ @ 400 nm	463-4141	215
$\lambda/2$ @ 800 nm + λ @ 400 nm	463-4211	215
$\lambda/2$ @ 800 nm + $\lambda/2$ @ 400 nm	463-4221	215
$\lambda/2$ @ 800 nm + $\lambda/4$ @ 400 nm	463-4241	215
$\lambda/4$ @ 800 nm + λ @ 400 nm	463-4411	215
$\lambda/4$ @ 800 nm + $\lambda/2$ @ 400 nm	463-4421	215
$\lambda/4$ @ 800 nm + $\lambda/4$ @ 400 nm	463-4441	215

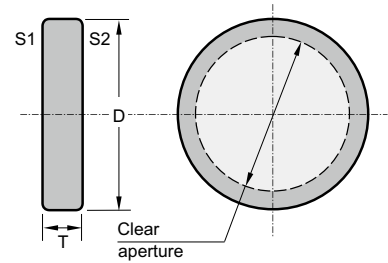
POLARIZATION PLANE ROTATORS

FEATURES

- › Made of crystalline quartz
- › Intended to rotate a beam polarization plane strictly to an appropriate angle using circular birefringent effect

Compared to a waveplate, a rotator has an intrinsic advantage, being independent of rotation around its own optical axis. It needs no adjustment, only to be installed normal to incident radiation. A polarization plane rotator is normally used for the specific wavelength. It is only slightly dependent on ambient temperature.

Polarization plane rotators for any wavelength from 200 to 2300 nm are available.



SPECIFICATIONS

Material	Single crystal quartz
Optical axis	Normal to faces S1, S2 of rotator
Clear aperture	Ø17 mm
Ring mount outer diameter	25.4 +0.0/-0.12 mm
Surface quality	20 – 10 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/10$ @ 633 nm
Parallelism	< 10 arcsec
AR coating	R < 0.5%
Laser damage threshold	100 mJ/cm ² , 50 fsec pulse, 800 nm typical

Center wavelength, nm	Rotation angle of polarization plane, deg	AR coating range, nm	Catalogue number	Price, EUR
1030	45	1000-1060	470-4904	215
1030	90	1000-1060	470-4909	215
800	45	760-840	470-4804	195
800	90	760-840	470-4809	195
780	45	740-820	470-4784	195
780	90	740-820	470-4789	195
515	45	500-530	470-4514	195
515	90	500-530	470-4519	195
400	45	380-420	470-4044	195
400	90	380-420	470-4049	195
343	45	333-353	470-4344	195
343	90	333-353	470-4349	195
266	45	257-275	470-4264	245
266	90	257-275	470-4269	245
257	45	250-265	470-4254	245
257	90	250-265	470-4259	245

RELATED PRODUCTS

Polarization plane rotators of other wavelengths
See page 1.72

Kinematic Mirror and Beamsplitter Mount 840-0020
Find more at [EksmaOptics.com](#)



Kinematic Positioning Mount 840-0193
Find more at [EksmaOptics.com](#)



GROUP VELOCITY DELAY COMPENSATION PLATES

Compensation plates are made of calcite. Plates are available with different orientation for different Group Velocity Delay compensation – starting from tens of femtosecond up to tens of picosecond delay compensation.

Standard GVD compensation plates are adjusted for required compensation by angular tuning changing the angle of incidence.

Suggested AOI is -5 to +5 deg, however they also can operate at larger AOI. Standard plates are made of 16×14 mm aperture, clear aperture Ø12 mm and mounted in to 1" ring holder. The optical axis is at special orientation – non parallel to faces of plate.

AR coatings for custom wavelengths are also available. Standard GVP compensation plates have clear aperture Ø12 mm. However, on special requests clear apertures up to 20 mm diameter can be produced.

SPECIFICATIONS

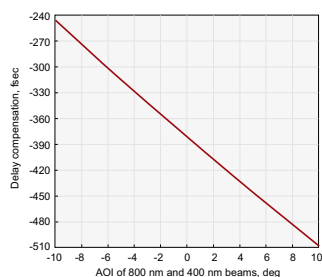
Material	Natural Calcite
Clear aperture	Ø12 mm
Ring mount outer diameter	25.4 +0.0 / -0.12 mm
Surface quality	40 – 20 scratch & dig (MIL-PRF-13830B)
Wavefront distortion	$\lambda/4$ @ 633 nm
Parallelism	<3 arc min
AR coating	R<0.5% 760-840 nm and R<1% at 380-420 nm

STANDARD CALCITE PLATES

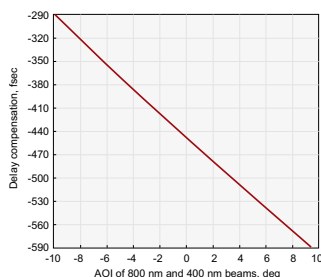
for delay compensation between 800 nm ("o" polarization) and 400 nm ("e" polarization) pulses

Delay compensation range*	Coatings	Catalogue number	Price, EUR
310 – 450 fsec	BBAR @ 800+400 nm	225-2113	470
370 – 520 fsec	BBAR @ 800+400 nm	225-2114	470
410 – 580 fsec	BBAR @ 800+400 nm	225-2111	470
440 – 630 fsec	BBAR @ 800+400 nm	225-2115	470

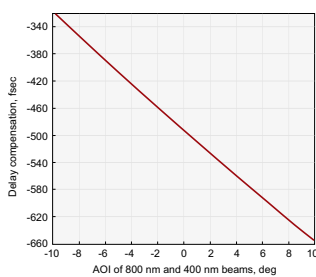
*GVD compensation range at Angle Of Incidence from -5° to +5°.



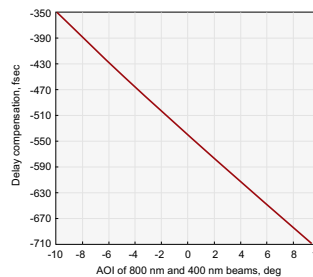
225-2113.



225-2114.



225-2111.



225-2115.

RELATED PRODUCTS

Thin BBO Crystals for SHG and THG of Ti:Sapphire laser wavelengths

See pages 4.35

Femtokits for THG of Femtosecond Ti:Sapphire Lasers

See page 4.38



Positioning Mount 840-0199 for Nonlinear Crystal Housing

See page 2.27



CRYSTAL WINDOWS FOR WHITE LIGHT (CONTINUUM) GENERATION

The interaction of intense laser pulses with transparent media (the crystals with cubic structure are more effective) can result in vast spectral broadening, ranging from the infrared to the ultraviolet spectral region. This continuum or white-light generation is a well-established phenomenon. Femtosecond

laser induced white light has been the source of ultrashort coherent radiation for numerous applications: time-resolved broadband pump–probe spectroscopy, optical pulse compression, and optical parametric amplification.



SPECIFICATIONS

Material	undoped YAG, orientation [111]
Clear aperture	>90% of diameter
Diameter tolerance	+0.00 / -0.13 mm
Thickness tolerance	±0.2 mm
Surface quality	20 – 10 scratch & dig
Transmitted wavefront distortion	$\lambda/4 - \lambda/10$ @ 633 nm
Parallelism	<30 arcsec
Coating	uncoated

SPECIFICATIONS

Material	sapphire, orientation c-cut [111]
Clear aperture	>90% of diameter
Diameter tolerance	+0.00 / -0.13 mm
Thickness tolerance	±0.2 mm
Surface quality	60 – 40 scratch & dig
Transmitted wavefront distortion	<1 λ @ 633 nm
Parallelism	<3 arcmin
Coating	uncoated

SPECIFICATIONS

Material	single crystal CaF ₂ , orientation [001]
Clear aperture	>90% of diameter
Diameter tolerance	+0.00 / -0.13 mm
Thickness tolerance	±0.2 mm
Surface quality	40 – 20 scratch & dig
Transmitted wavefront distortion	$\lambda/4 - \lambda/10$ @ 633 nm
Parallelism	<1 arcmin
Coating	uncoated

STANDARD YAG WINDOWS

Material	Diameter, mm	Thickness, mm	Transmitted wavefront distortion	Catalogue number	Price, EUR
YAG	12.7	1.0	$\lambda/4$	555-7121	185
YAG	12.7	2.0	$\lambda/4$	555-7122	185
YAG	12.7	3.0	$\lambda/10$	555-7123	195
YAG	12.7	4.0	$\lambda/10$	555-7124	195
YAG	12.7	6.0	$\lambda/10$	555-7126	215
YAG	12.7	8.0	$\lambda/10$	555-7128	230
YAG	25.4	1.0	$\lambda/4$	555-7251	225
YAG	25.4	2.0	$\lambda/4$	555-7252	225
YAG	25.4	3.0	$\lambda/10$	555-7253	245
YAG	25.4	4.0	$\lambda/10$	555-7254	245

STANDARD SAPPHIRE WINDOWS

Material	Diameter, mm	Thickness, mm	Transmitted wavefront distortion	Catalogue number	Price, EUR
Sapphire	12.7	0.5	1 λ	550-7120	26
Sapphire	12.7	1.0	1 λ	550-7121	25
Sapphire	12.7	2.0	1 λ	550-7122	25
Sapphire	12.7	3.0	1 λ	550-7123	25
Sapphire	12.7	4.0	1 λ	550-7124	27
Sapphire	12.7	5.0	1 λ	550-7125	29
Sapphire	12.7	6.0	1 λ	550-7126	30
Sapphire	12.7	8.0	1 λ	550-7128	50
Sapphire	20.0	0.5	1 λ	550-7200	35
Sapphire	20.0	1.0	1 λ	550-7201	35
Sapphire	20.0	1.5	1 λ	550-7215	35
Sapphire	20.0	2.0	1 λ	550-7202	35
Sapphire	25.4	0.5	1 λ	550-7250	45
Sapphire	25.4	1.0	1 λ	550-7251	45
Sapphire	25.4	2.0	1 λ	550-7252	45
Sapphire	25.4	3.0	1 λ	550-7253	45
Sapphire	25.4	4.0	1 λ	550-7254	45
Sapphire	25.4	5.0	1 λ	550-7255	50
Sapphire	25.4	6.0	1 λ	550-7256	70
Sapphire	25.4	8.0	1 λ	550-7258	80

STANDARD CaF₂ WINDOWS

Material	Diameter, mm	Thickness, mm	Transmitted wavefront distortion	Catalogue number	Price, EUR
CaF ₂	12.7	3.0	$\lambda/6$	531-5123	120
CaF ₂	12.7	4.0	$\lambda/8$	531-5124	140
CaF ₂	25.4	1.0	$\lambda/4$	531-5251	160
CaF ₂	25.4	2.0	$\lambda/4$	531-5252	160
CaF ₂	25.4	3.0	$\lambda/4$	531-5253	160
CaF ₂	25.4	4.0	$\lambda/10$	531-5254	180
CaF ₂	25.4	5.0	$\lambda/10$	531-5255	180

VARIABLE ATTENUATOR FOR FEMTOSECOND 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
- › Weight – 0.35 kg

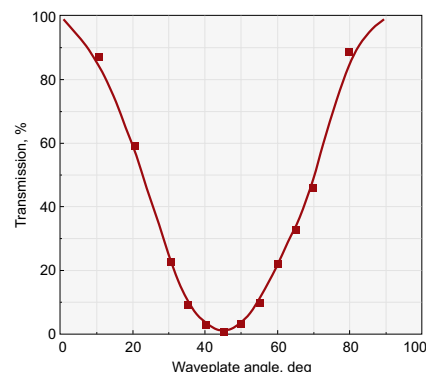
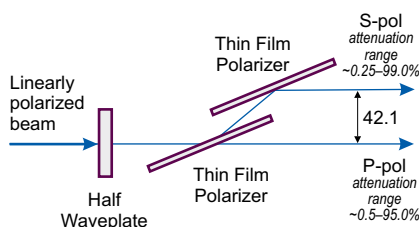
This variable attenuator/beamsplitter consists of special design opto-mechanical Adapter and precision opto-mechanical Holder 840-0197. Two Thin Film Brewster type polarizers, which reflect s-polarized light while transmitting p-polarized light, are housed into Adapter. Quartz Half Waveplates are housed 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.



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



SPECIFICATIONS

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
Time dispersion	t<4 fs for 100 fs Ti:Sapphire laser pulses
Polarization Contrast (after 1st polarizer)	>1:200
Polarization Contrast (after 2nd polarizer)	>1:500

FOR HIGH POWER LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257	945
266	990-0070-266	945
343	990-0070-343	840
400	990-0070-400	740
390-410	990-0070-400B	890
515	990-0070-515	740
505-525	990-0070-515B	890
800	990-0070-800	740
780-820	990-0070-800B	890
1030	990-0070-1030	740
1010-1050	990-0070-1030B	890

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257H	1020
266	990-0070-266H	1020
343	990-0070-343H	915
400	990-0070-400H	815
390-410	990-0070-400HB	965
515	990-0070-515H	815
505-525	990-0070-515HB	965
800	990-0070-800H	815
780-820	990-0070-800HB	965
1030	990-0070-1030H	815
1010-1050	990-0070-1030HB	965

Zero order optically contacted half waveplate is housed in rotating holder for high power femtosecond applications (Laser damage threshold: >10 mJ/cm², 50 fs pulse at 800 nm, typical).

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

RELATED PRODUCTS

Femtoline Zero Order Optically Contacted/Air-Spaced Plates

See page 4.23

Femtoline Thin Film Laser Polarizers

See page 4.20

Neutral Density Filters

See page 1.14

Motorized Variable Attenuator for Linearly Polarized Laser Beam 990-0070M

See page 5.15



Beam dumps 990-0800, 990-0820

See page 5.22



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

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 $\text{AOI}=70^\circ$ 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.

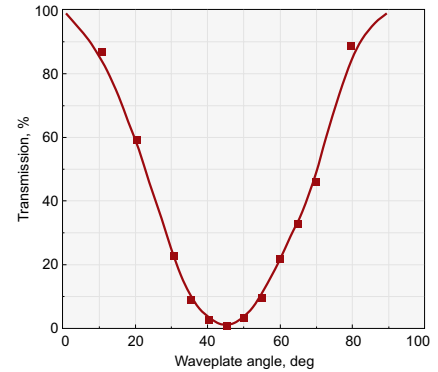
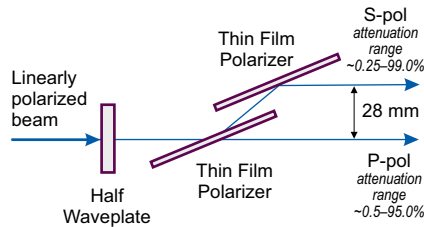
P-polarized beam is transmitted straightly with a 2.6 mm shift and s-polarized beam (after 2 reflections) is parallel to the outgoing p-polarized beam, just separated by 28 mm.

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.



990-0070-800HBBi70

990-0070-800HBBi70M



SPECIFICATIONS

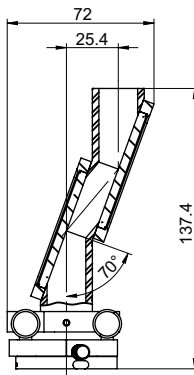
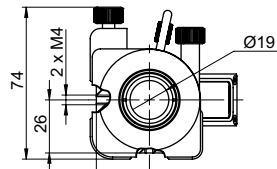
Aperture diameter	12 mm
Operating bandwidth	100 nm
Damage threshold	50 mJ/cm ² pulsed at 800 nm, 50 fsec, 50 Hz
Polarization contrast (after 1st polarizer)	>1:200
Polarization contrast (after 2nd polarizer)	>1:500

MANUAL ATTENUATORS

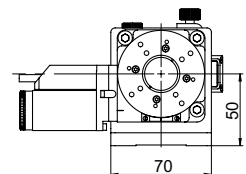
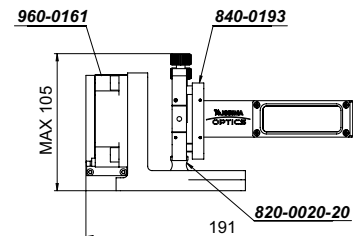
Wavelength, nm	Catalogue number	Price, EUR
750-850	990-0070-800HBBi70	1270
980-1080	990-0070-1030HBBi70	1270

MOTORIZED ATTENUATORS

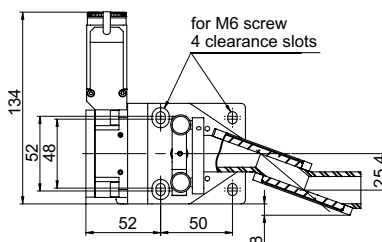
Wavelength, nm	Catalogue number	Price, EUR
750-850	990-0070-800HBBi70M	2050
980-1080	990-0070-1030HBBi70M	2050



990-0070-800HBBi70



990-0070-800HBBi70M



RELATED PRODUCTS

Neutral Density Filters

See page 1.14

Femtoline Zero Order Optically Contacted / Air-Spaced Plates

See page 4.23

Femtoline Thin Film Laser Polarizers

See page 4.20

VARIABLE ATTENUATOR FOR FEMTOSECOND LINEARLY POLARIZED LASER BEAM 990-0071

FEATURES

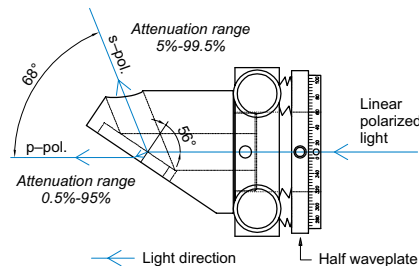
- › Divides laser beam into two beams of manually adjustable intensity ratio separated by 68° angle
- › Large dynamic range
- › Transmitted beam shift ~0.5 mm
- › High Optical damage threshold
- › Weight – 0.25 kg



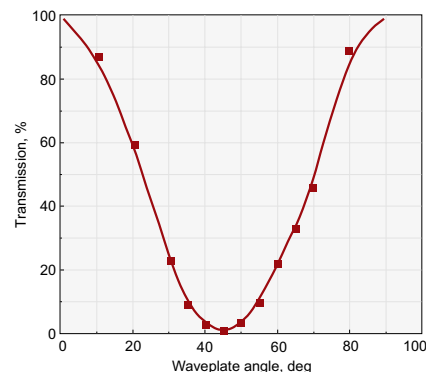
Note: Solid Base Height Extender 820-0210 and Standard Rod 820-0020-20 should be ordered separately

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 reflect 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.



SPECIFICATIONS

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
Time dispersion	t<4 fs for 100 fs Ti:Sapphire laser pulses
Polarization Contrast	>1:200

FOR HIGH POWER LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
257	990-0071-257	625
266	990-0071-266	625
343	990-0071-343	600
400	990-0071-400	550
390-410	990-0071-400B	650
515	990-0071-515	550
505-525	990-0071-515B	650
800	990-0071-800	550
780-820	990-0071-800B	650
1030	990-0071-1030	550
1010-1050	990-0071-1030B	650

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

Wavelength, nm	Catalogue number	Price, EUR
257	990-0071-257H	690
266	990-0071-266H	690
343	990-0071-343H	665
400	990-0071-400H	615
390-410	990-0071-400HB	715
515	990-0071-515H	615
505-525	990-0071-515HB	715
800	990-0071-800H	615
780-820	990-0071-800HB	715
1030	990-0071-1030H	615
1010-1050	990-0071-1030HB	715

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

RELATED PRODUCTS

Neutral Density Filters

See page 1.14

Femtoline Zero Order Optically Contacted / Air-Spaced Plates

See page 4.23

Femtoline Thin Film Laser Polarizers

See page 4.20

Motorized Variable Attenuator for Linearly Polarized Laser Beam 990-0071M

See page 5.18



VARIABLE ATTENUATOR FOR FEMTOSECOND LASER PULSES 990-0072

FEATURES

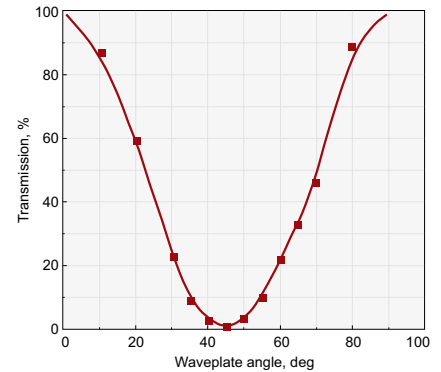
- › Divides laser beam into two beams of manually adjustable intensity ratio separated by 68° angle
- › Large dynamic range
- › Transmitted beam shift ~1 mm
- › High optical damage threshold
- › Motorized version 990-0072M available online



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 reflect s-polarized light while transmitting p-polarized light, is housed into Beamsplitter Mount 840-0056-12. A quartz Zero Order (optically contacted) Half Waveplate diameter 25.4 mm (for femtosecond applications) or Zero Order Air-Spaced Half Waveplate (for high power applications) is housed in rotating polarizer holder 840-0190-01 and placed in the incident linearly polarized laser beam.

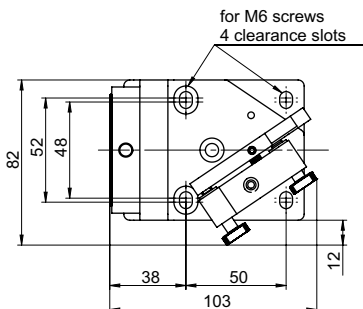
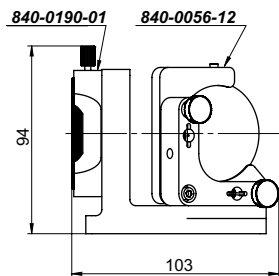
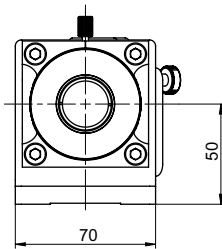
The intensity ratio of those two separated and different polarized beams may be continuously varied without alteration of other beam parameters by rotating the waveplate. The intensity of either exit beam, or their intensity ratio, can be controlled over a wide dynamic range. P-polarization could be selected for maximum transmission, or high-purity s-polarization could be reflected when maximum attenuation of the transmitted beam takes place.

The holder 840-0056-12 allows to adjust Angle Of Incidence of the Thin Film Brewster type polarizers by $\pm 4.5^\circ$ and to get the maximum extinction contrast. The mounts are on rods, rod holders and Movable Base 820-0090. The optical axis height from the table top can be adjusted in the range 78-88mm. Other height can be offered as custom changing the standard rods and rod holders into higher.



SPECIFICATIONS

Clear Aperture diameter	22 mm
Damage threshold	>10 mJ/cm ² , 50 fs pulse at 800 nm, typical
for high power applications	>100 mJ/cm ² , 50 fs pulse at 800 nm, typical
Polarization Contrast	>1:200
Transmitted beam shift	~ 1 mm
Weight	0.45 kg



FOR HIGH POWER LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266	950
343	990-0072-343	895
400	990-0072-400	865
515	990-0072-515	865
800	990-0072-800	880
780-820	990-0072-800B	980
1030	990-0072-1030	890
1010-1050	990-0072-1030B	980

A quartz Zero Order (optically contacted) Half Waveplate Ø25.4 mm is housed in rotating holder 840-0190-01.

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266H	1085
343	990-0072-343H	1030
400	990-0072-400H	1000
515	990-0072-515H	1000
800	990-0072-800H	1015
780-820	990-0072-800HB	1115
1030	990-0072-1030H	1025
1010-1050	990-0072-1030HB	1115

A quartz Zero Order Air-Spaced Half Waveplate clear aperture Ø22mm is housed in rotating holder 840-0190-01.

RELATED PRODUCTS

Neutral Density Filters

See page 1.14

Femtoline Zero Order Optically Contacted / Air-Spaced Plates

See page 4.23

Femtoline Thin Film Laser Polarizers

See page 4.20

Motorized Variable Attenuator for Linearly Polarized Laser Beam 990-0072M

Find more at [EksmaOptics.com](#)

VARIABLE ATTENUATOR FOR FEMTOSECOND LASER PULSES 990-0073

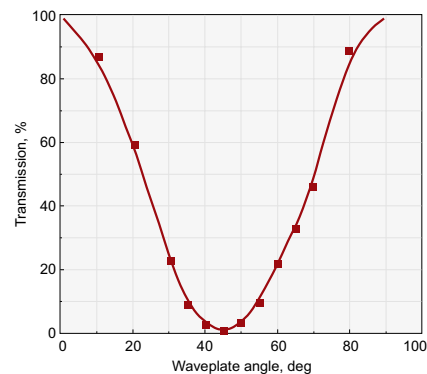
FEATURES

- › 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



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 reflect 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 or Zero Order Air-Spaced Half Waveplate Ø40 mm 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.

The holder 840-0056-13 allows to adjust Angle Of Incidence of the Thin Film Brewster type polarizers by $\pm 4.5^\circ$ and to get the maximum extinction contrast. The mounts are on rods, rod holders and Movable Base 820-0090. The optical axis height from the table top can be adjusted in the range 92-98 mm. Other height can be offered as custom changing the standard rods and rod holders into higher.



SPECIFICATIONS

Clear Aperture diameter	36 mm
Damage threshold	>10 mJ/cm ² , 50 fs pulse at 800 nm, typical
for high power applications	>100 mJ/cm ² , 50 fs pulse at 800 nm, typical
Polarization Contrast	>1:200
Transmitted beam shift	~ 1.4 mm
Weight	0.6 kg

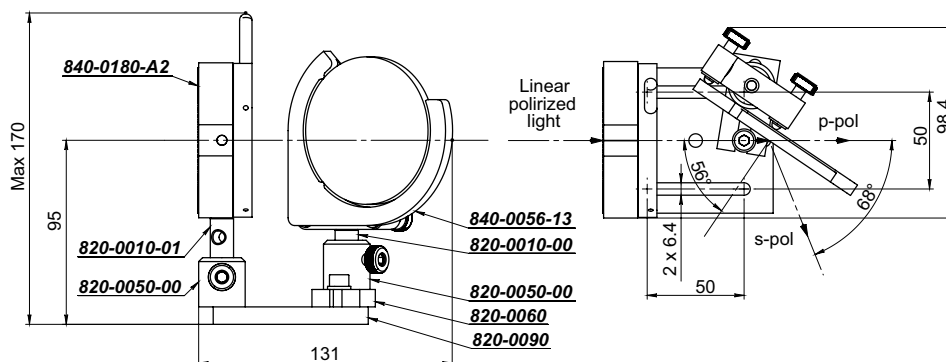
Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266	1690
343	990-0073-343	1560
400	990-0073-400	1540
515	990-0073-515	1540
800	990-0073-800	1560
780-820	990-0073-800B	1790
1030	990-0073-1030	1615
1010-1050	990-0073-1030B	1850

A quartz Zero Order (optically contacted) Half Waveplate Ø40 mm is housed in rotating holder 840-0180-A2.

FOR HIGH POWER LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266H	1790
343	990-0073-343H	1660
400	990-0073-400H	1640
515	990-0073-515H	1640
800	990-0073-800H	1660
780-820	990-0073-800HB	1890
1030	990-0073-1030H	1715
1010-1050	990-0073-1030HB	1950

A quartz Zero Order Air-Spaced Half Waveplate Ø40 mm is housed in rotating holder 840-0180-A2.



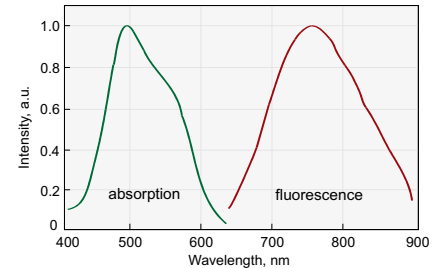
FemtoLine Laser Crystals

Ti:Sapphire (TITANIUM DOPED SAPPHIRE – $\text{Ti}:\text{Al}_2\text{O}_3$) LASER LINE AND HARMONICS



Ti:Sapphire laser crystal is used as a gain medium for tunable lasers and femtosecond solid-state lasers. Lasers based on Ti:Sapphire crystal are mainly used to generate ultrashort – femtosecond pulses.

The lasing band of Ti:Sapphire is 660-1050 nm, while common pump wavelength is frequency doubled Nd:YAG laser line at 532 nm or Argon Ion laser lines at 490-514 nm. The peak of emission in Ti:Sapphire is at 790-800 nm wavelength.



MATERIAL PHYSICAL AND LASER PROPERTIES

Chemical formula	$\text{Ti}^{3+}:\text{Al}_2\text{O}_3$
Crystal structure	Hexagonal
Lattice constants	$a=4.748$, $c=12.957$
Density	3.98 g/cm^3
Mohs hardness	9
Thermal conductivity	$0.11 \text{ cal}/(^{\circ}\text{C}\cdot\text{sec}\cdot\text{cm})$
Specific heat	0.10 cal/g
Melting point	2050°C
Laser action	4-Level Vibronic
Fluorescence lifetime	$3.2 \mu\text{sec}$ ($T=300\text{K}$)
Tuning range	660–1050 nm
Absorption range	400–600 nm
Emission peak	795 nm
Absorption peak	488 nm
Refractive index	1.76 @ 800 nm

STANDARD PRODUCT SPECIFICATIONS

Orientation	optical axis C normal to rod axis
Ti_2O_3 concentration	0.03–0.25 wt %
Figure of Merit	> 150
Size	up to 15 mm dia and up to 30 mm length
End configurations	flat/flat or Brewster/Brewster
End flatness	$\lambda/10$ @ 633 nm
Parallelism	10 arcsec
Surface finishing	10-5 scratch & dig
Wavefront distortion	$\lambda/4$ inch

Note: To inquire or order a finished Ti:Sa laser rod, please provide detailed specifications. Dopant concentration, size of crystal and end configuration are essential specifications.

FREQUENCY CONVERSION OF Ti:Sapphire LASER WAVELENGTHS

Frequency doubling and tripling allow access to the green, blue and ultraviolet spectral regions. While the frequency conversion by Optical Parametric Generation offers wide tuning range in the near-infrared spectral region, it is often sufficient to tune the Ti:sapphire wavelength for tuning the

OPO, rather than tuning the OPO itself, e.g. by actively affecting the phase-matching conditions. Further wavelength extension to mid infrared range is possible by Difference Frequency Generation employing signal and idler wavelength pulses obtained from OPO.

CRYSTALS SELECTION FOR Ti:Sapphire LASER FREQUENCY CONVERSION

Thin BBO crystals for SHG @ 800 nm	→	350 – 450 nm range
Thin BBO crystals for THG @ 800 nm	→	230 – 300 nm range
Thin BBO crystals for OPG/OPA @ pump 800 nm	→	1050 – 2300 nm range
Thin BBO crystals for OPG/OPA @ pump 400 nm	→	480 – 2300 nm range
AgGaS ₂ crystals for DFG	→	2500 – 12000 nm range

THIN BBO CRYSTALS FOR SHG AND THG OF TI:SAPPHIRE LASER WAVELENGTH

OPTICAL
COMPONENTS

NONLINEAR & LASER
CRYSTALS

ND:YAG LASERLINE
COMPONENTS

FEMTOLINE
COMPONENTS

OPTICAL
SYSTEMS

OPTO-MECHANICAL
COMPONENTS



FREE STANDING BBO CRYSTALS

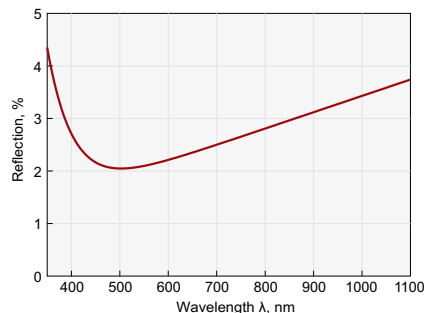
The crystals down to 100 μm can be supplied as free standing crystals not attached to the support. However, ring mounts are highly recommended for safe handling of these thin crystals. Minimum aperture of free standing BBO is 5x5 mm, maximum aperture is 22x22 mm. The tolerance is $\pm 50 \mu\text{m}$ for crystals of thickness down to 300 μm and $\pm 20 \mu\text{m}$ for crystals of thickness down to 100 μm .

OPTICALLY CONTACTED CRYSTALS

BBO crystals less than 100 μm thickness can be supplied optically contacted on UV Fused Silica substrate sizes 10x10x1 mm or 12x12x2 mm. Other sizes of substrates are also available on request. Minimum aperture of optically contacted BBO is 5x5 mm, maximum aperture is 10x10 mm. The tolerance of crystal thickness is $\pm 10/-5$ microns.

PROTECTIVE COATINGS FOR BBO CRYSTALS

P-protective coating – is a single or two layer antireflection coating made at specified wavelength range. Typical reflection values are $R < 2\%$ in the mid range, $R < 4\%$ at the edges. P coating is highly recommended for ultrashort pulse applications and features low dispersion and very high laser damage threshold.



Typical P-coating for BBO SHG@800 nm application

STANDARD SPECIFICATIONS OF ULTRATHIN BBO CRYSTALS

Flatness	$\lambda/8$ @ 633 nm
Parallelism	< 20 arcsec
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Clear aperture	$> 90\%$ of full aperture
Laser damage threshold	$> 200 \text{ GW/cm}^2$, 133 fsec pulse, 800 nm typical, 50 Hz

EKSMA OPTICS recommends the following thickness BBO crystals depending on application and fundamental wavelength pulse duration, assuming it is spectrum limited Gaussian pulse.

Application	Pulse duration, fs	Thickness, mm
Type 1, SHG @ 800 nm, $\Theta=29.2^\circ$, $\varphi=90^\circ$	10	0.05
	20	0.1
	50	0.2
	100	0.5
	200	1
Type 1, THG @ 800 nm, $\Theta=44.3^\circ$, $\varphi=90^\circ$	10	0.01
	20	0.02
	50	0.05
	100	0.1
	200	0.2

BBO FOR SHG @ 800 nm

BBO CRYSTAL. Thickness = 0.05 mm*

Aperture, mm	UV FS support size, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6×6	10×10×2	29.2	90	P/P @ 400-800 nm	BBO-600H	948
8×8	10×10×2	29.2	90	P/P @ 400-800 nm	BBO-800H	990
10×10	12×12×2	29.2	90	P/P @ 400-800 nm	BBO-1000H	1110

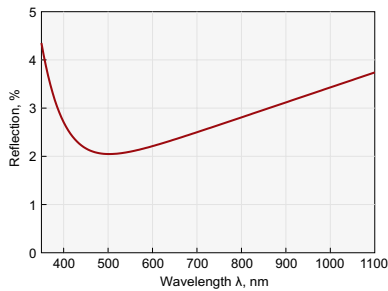
* All BBO crystals of thickness less than 100 μm are optically contacted onto UV FS support.
All crystals are mounted into open ring holders.

SHG BBO CRYSTALS. Thickness = 0.1 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-601H	505
8×8	29.2	90	P/P @ 400-800 nm	BBO-801H	710
10×10	29.2	90	P/P @ 400-800 nm	BBO-1001H	800
12×12	29.2	90	P/P @ 400-800 nm	BBO-1201H	1295
15×15	29.2	90	P/P @ 400-800 nm	BBO-1501H	2040
20×20	29.2	90	P/P @ 400-800 nm	BBO-2001H	3785
22×22	29.2	90	P/P @ 400-800 nm	BBO-2201H	5155

SHG BBO CRYSTAL. Thickness = 0.5 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-603H	440
8×8	29.2	90	P/P @ 400-800 nm	BBO-803H	665
10×10	29.2	90	P/P @ 400-800 nm	BBO-1003H	760
12×12	29.2	90	P/P @ 400-800 nm	BBO-1203H	1265
15×15	29.2	90	P/P @ 400-800 nm	BBO-1503H	1980
20×20	29.2	90	P/P @ 400-800 nm	BBO-2003H	3720
22×22	29.2	90	P/P @ 400-800 nm	BBO-2203H	5150



P-protective coating curve of Type 1
($\theta=29.2^\circ$, $\varphi=90^\circ$) BBO crystal used for SHG@800 nm

SHG BBO CRYSTAL. Thickness = 0.2 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-602H	505
8×8	29.2	90	P/P @ 400-800 nm	BBO-802H	710
10×10	29.2	90	P/P @ 400-800 nm	BBO-1002H	790
12×12	29.2	90	P/P @ 400-800 nm	BBO-1202H	1285
15×15	29.2	90	P/P @ 400-800 nm	BBO-1502H	2020
20×20	29.2	90	P/P @ 400-800 nm	BBO-2002H	3725
22×22	29.2	90	P/P @ 400-800 nm	BBO-2202H	5150

SHG BBO CRYSTAL. Thickness = 1 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-604H	390
8×8	29.2	90	P/P @ 400-800 nm	BBO-804H	615
10×10	29.2	90	P/P @ 400-800 nm	BBO-1004H	765
12×12	29.2	90	P/P @ 400-800 nm	BBO-1204H	1150
15×15	29.2	90	P/P @ 400-800 nm	BBO-1504H	1860
20×20	29.2	90	P/P @ 400-800 nm	BBO-2004H	3575
22×22	29.2	90	P/P @ 400-800 nm	BBO-2204H	4580

SHG BBO CRYSTAL. Thickness = 2 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-605H	360
8×8	29.2	90	P/P @ 400-800 nm	BBO-805H	620
10×10	29.2	90	P/P @ 400-800 nm	BBO-1005H	830
12×12	29.2	90	P/P @ 400-800 nm	BBO-1205H	1200
15×15	29.2	90	P/P @ 400-800 nm	BBO-1505H	1910
20×20	29.2	90	P/P @ 400-800 nm	BBO-2005H	3625
22×22	29.2	90	P/P @ 400-800 nm	BBO-2205H	4630

HOUSING ACCESSORIES

Ring Holders
for Nonlinear Crystals
See page 2.26



Positioning Mount
840-0199 for
Nonlinear Crystal
Housing
See page 2.27



BBO FOR THG @ 800 nm

BBO CRYSTAL. Thickness = 0.01 mm, optically contacted

Aperture, mm	UV FS support size, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	10x10x2	44.3	90	P/P @ 400-800/266	BBO-606H	1020
8x8	10x10x2	44.3	90	P/P @ 400-800/266	BBO-806H	1060
10x10	12x12x2	44.3	90	P/P @ 400-800/266	BBO-1006H	1175

BBO CRYSTAL. Thickness = 0.02 mm, optically contacted

Aperture, mm	UV FS support size, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	10x10x2	44.3	90	P/P @ 400-800/266	BBO-607H	1020
8x8	10x10x2	44.3	90	P/P @ 400-800/266	BBO-807H	1060
10x10	12x12x2	44.3	90	P/P @ 400-800/266	BBO-1007H	1175

BBO CRYSTAL. Thickness = 0.05 mm, optically contacted

Aperture, mm	UV FS support size, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	10x10x2	44.3	90	P/P @ 400-800/266	BBO-608H	948
8x8	10x10x2	44.3	90	P/P @ 400-800/266	BBO-808H	990
10x10	12x12x2	44.3	90	P/P @ 400-800/266	BBO-1008H	1110

THG BBO CRYSTAL. Thickness = 0.1 mm

Aperture, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	44.3	90	P/P @ 400-800/266	BBO-609H	505
8x8	44.3	90	P/P @ 400-800/266	BBO-809H	710
10x10	44.3	90	P/P @ 400-800/266	BBO-1009H	800
12x12	44.3	90	P/P @ 400-800/266	BBO-1209H	1330
15x15	44.3	90	P/P @ 400-800/266	BBO-1509H	2140
20x20	44.3	90	P/P @ 400-800/266	BBO-2009H	3925
22x22	44.3	90	P/P @ 400-800/266	BBO-2209H	5355

THG BBO CRYSTAL. Thickness = 0.2 mm

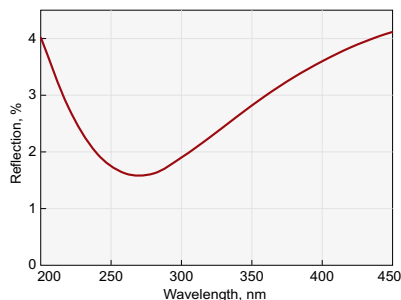
Aperture, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	44.3	90	P/P @ 400-800/266	BBO-610H	505
8x8	44.3	90	P/P @ 400-800/266	BBO-810H	710
10x10	44.3	90	P/P @ 400-800/266	BBO-1010H	790
12x12	44.3	90	P/P @ 400-800/266	BBO-1210H	1285
15x15	44.3	90	P/P @ 400-800/266	BBO-1510H	2020
20x20	44.3	90	P/P @ 400-800/266	BBO-2010H	3915
22x22	44.3	90	P/P @ 400-800/266	BBO-2210H	5310

THG BBO CRYSTAL. Thickness = 0.5 mm

Aperture, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	44.3	90	P/P@400-800/266	BBO-611H	440
8x8	44.3	90	P/P@400-800/266	BBO-811H	665
10x10	44.3	90	P/P@400-800/266	BBO-1011H	760
12x12	44.3	90	P/P@400-800/266	BBO-1211H	1265
15x15	44.3	90	P/P@400-800/266	BBO-1511H	1980
20x20	44.3	90	P/P@400-800/266	BBO-2011H	3900
22x22	44.3	90	P/P@400-800/266	BBO-2211H	5300

THG BBO CRYSTAL. Thickness = 1 mm

Aperture, mm	θ , deg	ϕ , deg	Coating	Catalogue number	Price, EUR
6x6	44.3	90	P/P @ 400-800/266	BBO-612H	390
8x8	44.3	90	P/P @ 400-800/266	BBO-812H	625
10x10	44.3	90	P/P @ 400-800/266	BBO-1012H	785
12x12	44.3	90	P/P @ 400-800/266	BBO-1212H	1210
15x15	44.3	90	P/P @ 400-800/266	BBO-1512H	1920
20x20	44.3	90	P/P @ 400-800/266	BBO-2012H	3860
22x22	44.3	90	P/P @ 400-800/266	BBO-2212H	4960



*P-protective coating curve of Type 1 ($\theta=44.3^\circ$, $\phi=90^\circ$)
BBO crystal's exit face used for THG@800 nm*

RELATED PRODUCTS

Zero Order Dual Wavelength Plates

See page 4.24

Ring Holders for Nonlinear Crystals

See page 2.26



Positioning Mount 840-0199 for Nonlinear Crystal Housing

See page 2.27



FEMTOKITS FOR THIRD HARMONIC GENERATION OF FEMTOSECOND Ti:Sapphire LASER

Kits consist of set of components required for efficient third harmonic generation of femtosecond Ti:Sapphire laser. The schemes of the third harmonic generation in basic and extended Femtokits are presented below.

BASIC FEMTOKIT FK SERIES

The thickness of SHG BBO crystal, THG BBO crystal and group delay compensation plate is different in each kit and is optimal for certain pulse duration of fundamental harmonic to avoid harmonic pulses broadening.

Basic Femtokit FK series includes:

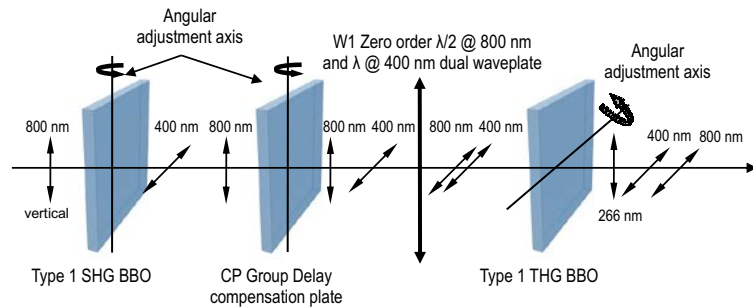
- › Type 1 SHG BBO crystal with 6×6 mm aperture, P-coated @ 400-800 nm,
- › Type 1 THG BBO crystal with 6×6 mm aperture, P-coated @ 400-800/266 nm,
- › Calcite plate for group velocity delay compensation CP, AR coated @ 800+400 nm,
- › Zero order dual waveplate W1, optically contacted, AR coated @ 800+400 nm,
- › All above four components are mounted in to 1 inch ring holders for convenient handling.

Fundamental pulse duration	Basic FemtoKit FK Series		Basic Mounted FemtoKit FK Series	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
150 – 250 fsec	FK-800-200	1710	FK-800-200-M	2658
120 – 150 fsec	FK-800-130	1760	FK-800-130-M	2708
70 – 120 fsec	FK-800-100	1760	FK-800-100-M	2708
30 – 70 fsec	FK-800-050	2268	FK-800-050-M	3216
15 – 30 fsec	FK-800-020	2340	FK-800-020-M	3288

Non-standard kits with larger apertures of BBO crystals and thicknesses optimal for other pulse durations are available on request.



Mounted Femtokit FK Series



EXTENDED FEMTOKIT FKE SERIES

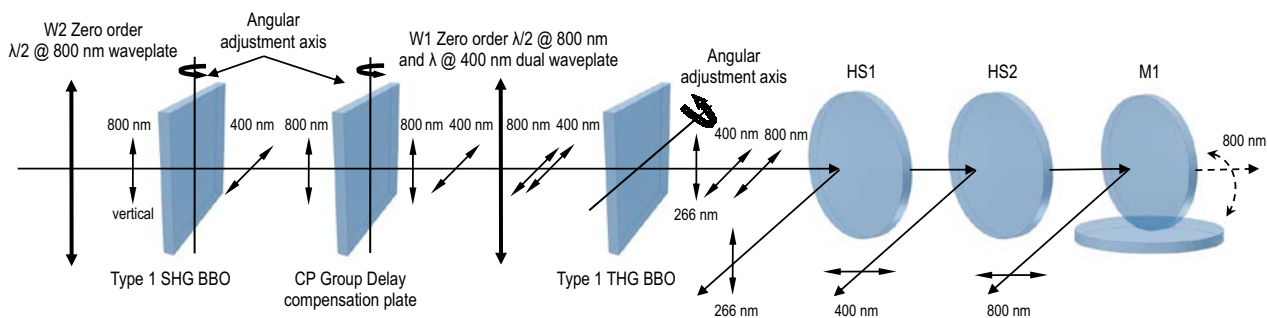
Up to 50% SHG conversion efficiency which was achieved in 0.5 mm SHG BBO crystal with Ti:Sapphire Super Spitfire laser operating at 1 kHz, 130 fs, 20-100 μ J @ 800 nm and effective beam diameter 0.9 mm. THG efficiency was reached up to 8% from fundamental using FKE-800-100 Femtokit.

Extended Femtokit FKE series includes:

- > All components from basic kit,
- > Additional zero order waveplate W2, optically contacted, AR coated @ 800 nm,
- > Harmonic Separator HS1 HR @ 266 nm and HT @ 800+400 nm at AOI=45 deg,
- > Harmonic Separator HS2 HR @ 400 nm and HT @ 800 nm at AOI=45 deg,
- > Laser mirror M1, HR at 800 nm at AOI=45 deg.

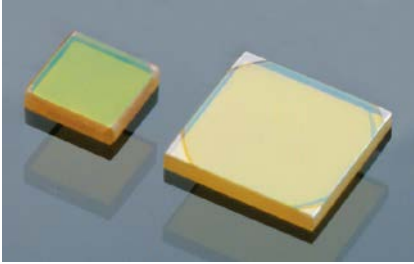
Fundamental pulse duration	Extended FemtoKit FKE Series		Extended Mounted FemtoKit FKE Series	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
150 – 250 fsec	FKE-800-200	2402	FKE-800-200-M	4122
120 – 150 fsec	FKE-800-130	2452	FKE-800-130-M	4172
70 – 120 fsec	FKE-800-100	2452	FKE-800-100-M	4172
30 – 70 fsec	FKE-800-050	2960	FKE-800-050-M	4680
15 – 30 fsec	FKE-800-020	3032	FKE-800-020-M	4752

Non-standard kits with larger apertures of BBO crystals and thicknesses optimal for other pulse durations are available on request.



Extended Mounted Femtokit FKE Series

THIN AgGaS₂ CRYSTALS FOR DFG → 2.5 – 1.3 μm



STANDARD SPECIFICATIONS

Flatness	$\lambda/6$ @ 633 nm
Parallelism	< 20 arcsec
Perpendicularity	< 10 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Clear aperture	> 90% of full aperture

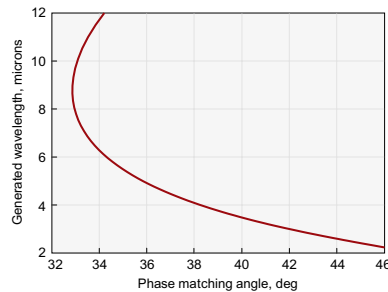
BBAR COATED AgGaS₂ CRYSTALS

BBAR coating – is multilayer dielectric antireflection coating made at specified wavelength range. Standard coating is designed to reduce reflection losses at input side at 1.1 – 2.6 micron range and output side at 2.6 – 11 micron range.

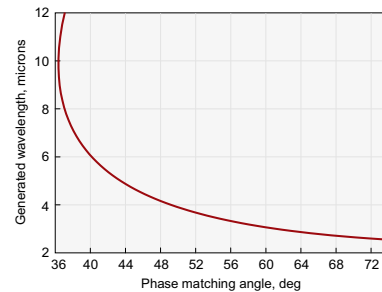
Typical reflection values are $R < 0.5\%$ in the mid range, and up to reflection values of uncoated crystal at the edges of given ranges. BBAR coating is designed to minimise dispersion of ultrashort pulses and also features high damage threshold.

Size, mm			Orientation		Coating	Application	Catalogue number	Price, EUR
W	H	L	θ	ϕ				
5	5	1	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm → 2.4-11 μm	AGS-401H	835
6	6	2	50	0	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm → 2.4-11 μm	AGS-402H	1345
5	5	0.4	34	45	BBAR/BBAR @ 3-6 / 1.5-3 μm	SHG @ 3-6 μm, Type 1	AGS-403H	995
5	5	0.4	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm → 2.4-11 μm	AGS-404H	995
8	8	0.4	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm → 2.4-11 μm	AGS-801H	2340
8	8	1	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 μm	DFG @ 1.2-2.4 μm → 2.4-11 μm	AGS-802H	2140

Crystals are mounted into open ring holders (see page 2.26).



Type 1 DFG (e-o=e) in AGS. DFG of signal and idler generated in BBO pumped at 800 nm



Type 2 DFG (e-o=e) in AGS. DFG of signal and idler generated in BBO pumped at 800 nm

HOUSING ACCESSORIES

Ring Holders
for Nonlinear Crystals
See page 2.26



Positioning Mount
840-0199 for
Nonlinear Crystal
Housing
See page 2.27



Yb:KGW AND Yb:KYW CRYSTALS LASER LINES AND HARMONICS



FEATURES

- High absorption coefficient at 981 nm
- High stimulated emission cross section
- Low laser threshold
- Extremely low quantum defect $\lambda_{\text{pump}} / \lambda_{\text{se}}$
- Broad polarized output at 1023–1060 nm
- High slope efficiency with diode pumping (~60%)
- High Yb doping concentration

CUSTOM MANUFACTURING CAPABILITIES

- Various shapes (slabs, rods, cubes, disks)
- Different dopant levels
- Diversified coatings
- Attractive prices for introductory quantities to OEMs

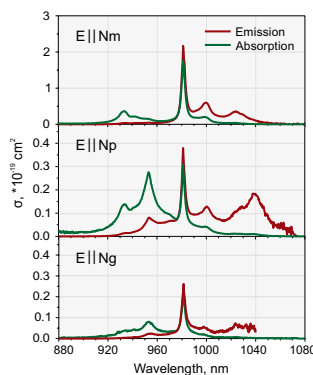
Yb:KGW and Yb:KYW crystals have broad emission bandwidths and are used as lasing materials to generate ultrashort (~100 – 200 fs) high power pulses. Direct pump of Yb:KGW/KYW crystals with laser diodes operating at 981 nm supports compact laser systems. Yb:KGW/KYW laser generates

pulses at 1023 – 1060 nm wavelength range. Also Yb:KGW and Yb:KYW can be used as ultrashort pulse amplifiers.

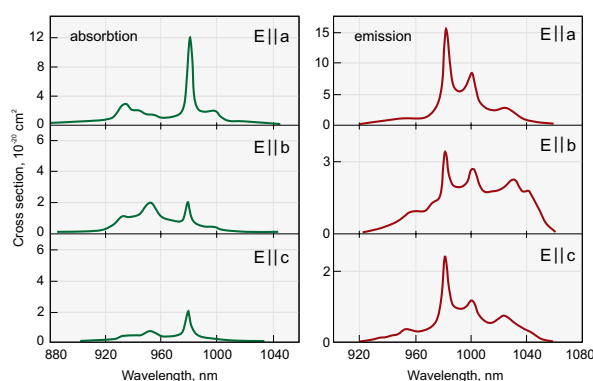
We believe that Yb:KGW and Yb:KYW are some of the best materials for high power thin disk lasers generating femtosecond pulses.

PROPERTIES OF Yb:KGW AND Yb:KYW

Name	Yb:KGW	Yb:KYW
Yb ³⁺ concentration	0.5–5%	0.5–100%
Crystal structure	monoclinic	monoclinic
Point group	C2/c	C2/c
Lattice parameters	a=8.095 Å, b=10.43 Å, c=7.588 Å, β=94.43°	a=8.05 Å, b=10.35 Å, c=7.54 Å, β=94°
Thermal expansion	$\alpha_a=4 \times 10^{-6} / ^\circ\text{C}$, $\alpha_b=3.6 \times 10^{-6} / ^\circ\text{C}$, $\alpha_c=8.5 \times 10^{-6} / ^\circ\text{C}$	—
Thermal conductivity	$K_a=2.6 \text{ W/mK}$, $K_b=3.8 \text{ W/mK}$, $K_c=3.4 \text{ W/mK}$	—
Density	7.27 g/cm ³	6.61 g/cm ³
Mohs' hardness	4–5	4–5
Melting temperature	1075 °C	—
Transmission range	0.35–5.5 μm	0.35–5.5 μm
Refractive indices (λ=1.06 μm)	$n_g=2.037$, $n_p=1.986$, $n_m=2.033$	—
Thermo-optic coefficients @ 1064 nm	$\partial n_p / \partial T = -15.7 \times 10^{-6} \text{ K}^{-1}$ $\partial n_m / \partial T = -11.8 \times 10^{-6} \text{ K}^{-1}$ $\partial n_g / \partial T = -17.3 \times 10^{-6} \text{ K}^{-1}$	For 20% Yb:KYW $\partial n_p / \partial T = -13.08 \times 10^{-6} \text{ K}^{-1}$ $\partial n_m / \partial T = -7.61 \times 10^{-6} \text{ K}^{-1}$ $\partial n_g / \partial T = -11.83 \times 10^{-6} \text{ K}^{-1}$
Laser wavelength	1023–1060 nm	1025–1058 nm
Fluorescence lifetime	0.3 ms	0.3 ms
Stimulated emission cross section (E a)	$2.6 \times 10^{-20} \text{ cm}^2$	$3 \times 10^{-20} \text{ cm}^2$
Absorption peak and bandwidth	$\alpha_a=26 \text{ cm}^{-1}$, λ=981 nm, Δλ=3.7 nm	$\alpha_a=40 \text{ cm}^{-1}$, λ=981 nm, Δλ=3.5 nm
Absorption cross section	$1.2 \times 10^{-19} \text{ cm}^2$	$1.33 \times 10^{-19} \text{ cm}^2$
Lasing threshold	35 mW	70 mW
Stark levels energy (in cm ⁻¹) of the ² F _{5/2} manifolds of Yb ³⁺ @ 77K	10682, 10471, 10188	10695, 10476, 10187
Stark levels energy (in cm ⁻¹) of the ² F _{7/2} manifolds of Yb ³⁺ @ 77K	535, 385, 163, 0	568, 407, 169, 0



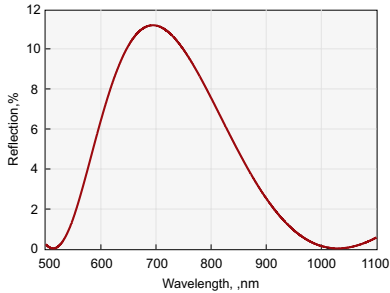
Absorption and stimulated emission cross sections of Yb:KYW



Absorption and emission spectra of Yb(5%):KGW

BBO AND LBO CRYSTALS FOR Yb:KGW/KYW FREQUENCY CONVERSION

EKSMA OPTICS recommends the following thickness BBO and LBO crystals for Yb:KGW/KYW frequency conversion depending on fundamental wavelength pulse duration, assuming it is spectrum limited Gaussian pulse.



Typical AR@1030+515 nm coating for LBO or BBO SHG@1030 nm application

BBO CRYSTALS

Pulse duration	BBO SHG @ 1030 nm	BBO THG @ 1030 nm	BBO 4HG @ 1030 nm
50 fs	0.5 mm	0.15 mm	0.1 mm
100 fs	1 mm	0.25 mm	0.15 mm
150 fs	1.5 mm	0.4 mm	0.2 mm
200 fs	2 mm	0.55 mm	0.3 mm

LBO CRYSTALS

Pulse duration	LBO SHG @ 1030 nm
50 fs	0.9 mm
100 fs	1.9 mm
150 fs	2.8 mm
200 fs	3.7 mm

Note:
LBO crystals can be supplied with Clear Aperture up to 50 mm diameter.

LBO FOR SHG @ 1030 nm

SHG LBO CRYSTALS. Type 1, Thickness = 0.9 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	90	13.8	AR/AR @ 515+1030 nm	LBO-601H	515
8x8	90	13.8	AR/AR @ 515+1030 nm	LBO-801H	620
10x10	90	13.8	AR/AR @ 515+1030 nm	LBO-1001H	650

SHG LBO CRYSTALS. Type 1, Thickness = 2.8 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	90	13.8	AR/AR @ 515+1030 nm	LBO-603H	545
8x8	90	13.8	AR/AR @ 515+1030 nm	LBO-803H	790
10x10	90	13.8	AR/AR @ 515+1030 nm	LBO-1003H	1035

BBO FOR SHG @ 1030 nm

SHG BBO CRYSTALS. Type 1, Thickness = 0.5 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	23.4	90	AR/AR @ 515+1030 nm	BBO-651H	495
8x8	23.4	90	AR/AR @ 515+1030 nm	BBO-851H	640
10x10	23.4	90	AR/AR @ 515+1030 nm	BBO-1051H	760

SHG BBO CRYSTALS. Type 1, Thickness = 1.5 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	23.4	90	AR/AR @ 515+1030 nm	BBO-653H	475
8x8	23.4	90	AR/AR @ 515+1030 nm	BBO-853H	600
10x10	23.4	90	AR/AR @ 515+1030 nm	BBO-1053H	795

BBO FOR THG @ 1030 nm

Aperture, mm	Thickness, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	0.15	32.5	90	AR/AR @ 1030+515/343 nm	BBO-631H	725
6x6	0.25	32.5	90	AR/AR @ 1030+515/343 nm	BBO-632H	665
6x6	0.4	32.5	90	AR/AR @ 1030+515/343 nm	BBO-633H	605
6x6	0.55	32.5	90	AR/AR @ 1030+515/343 nm	BBO-634H	540

SHG LBO CRYSTALS. Type 1, Thickness = 1.9 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	90	13.8	AR/AR @ 515+1030 nm	LBO-602H	460
8x8	90	13.8	AR/AR @ 515+1030 nm	LBO-802H	610
10x10	90	13.8	AR/AR @ 515+1030 nm	LBO-1002H	815

SHG LBO CRYSTALS. Type 1, Thickness = 3.7 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	90	13.8	AR/AR @ 515+1030 nm	LBO-604H	465
8x8	90	13.8	AR/AR @ 515+1030 nm	LBO-804H	660
10x10	90	13.8	AR/AR @ 515+1030 nm	LBO-1004H	895

SHG BBO CRYSTALS. Type 1, Thickness = 1.0 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	23.4	90	AR/AR @ 515+1030 nm	BBO-652H	430
8x8	23.4	90	AR/AR @ 515+1030 nm	BBO-852H	560
10x10	23.4	90	AR/AR @ 515+1030 nm	BBO-1052H	785

SHG BBO CRYSTALS. Type 1, Thickness = 2.0 mm

Aperture, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	23.4	90	AR/AR @ 515+1030 nm	BBO-654H	480
8x8	23.4	90	AR/AR @ 515+1030 nm	BBO-854H	630
10x10	23.4	90	AR/AR @ 515+1030 nm	BBO-1054H	835

BBO FOR 4HG @ 1030 nm

Aperture, mm	Thickness, mm	θ , deg	φ , deg	Coating	Catalogue number	Price, EUR
6x6	0.1	50	90	P/P @ 515/257 nm	BBO-641H	600
6x6	0.15	50	90	P/P @ 515/257 nm	BBO-642H	570
6x6	0.2	50	90	P/P @ 515/257 nm	BBO-643H	550
6x6	0.3	50	90	P/P @ 515/257 nm	BBO-644H	535

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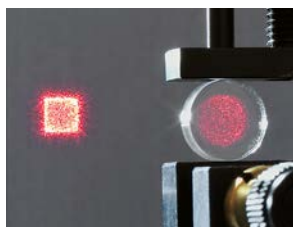
Compact Beam Expander
page 5.4



Zoom Beam Expander
page 5.4



Simple Telescope Kit
page 5.5



Gauss-to-Top Hat Beam
Shaping Lens
page 5.6



Continuously Variable
Attenuator / Beamsplitter **990-0060**
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Variable Attenuators for linearly
polarized laser beam **990-0070**
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Motorized Variable Attenuator
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990-0070M page 5.15



Variable Attenuators for linearly
polarized laser beam **990-0071**
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Motorized Variable Attenuator
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990-0071M page 5.18



Variable Attenuator for femtosecond
laser pulses **990-0072**
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Variable Attenuator for femtosecond
and Nd:YAG laser pulses **990-0073**
page 5.20



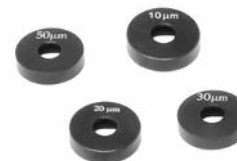
Precision Spatial Filter
990-1000
Find more at EksmaOptics.com



Y-Z Positioner for lens, pinholes and
objectives **990-0100, 990-0200**
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Y-Z Positioners for lens, pinholes and
objectives **990-0050, 990-0051**
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Unmounted Iris Diaphragms
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Mounted Iris Diaphragms
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Mounts for iris diaphragms
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Motorized Iris Diaphragms
995 Series
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Motorized Iris Diaphragms
996 Series
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Motorized Iris Diaphragms
997 Series
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Variable Wheel Attenuator
990-0604
Find more at EksmaOptics.com



Closed Variable Wheel Attenuator
990-0704
Find more at EksmaOptics.com



Filters Holder with 90° Flip
990-0400
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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 **990-0800**
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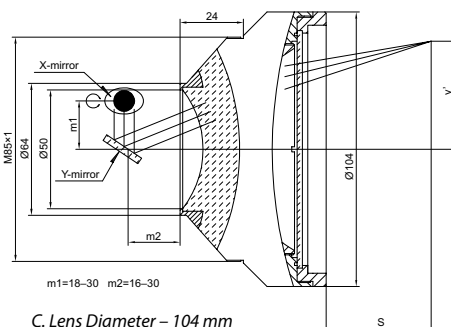
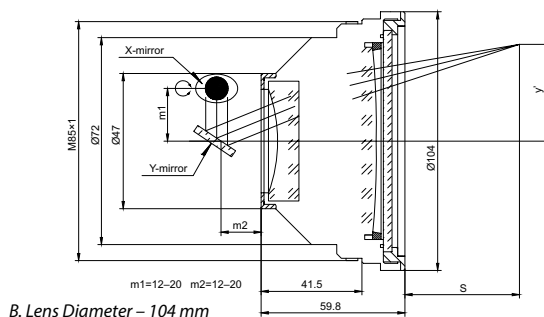
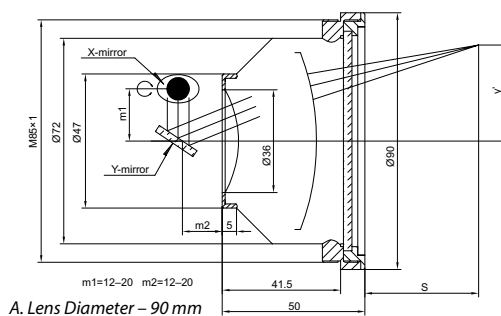


Water-cooled Beam Dump **990-0820**
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F-THETA LENS



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.



BEST MIRROR PLACES m1/m2 – 16/16 mm, screw size – M85×1

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, μ m	Drawing	Catalogue number	Price, EUR
100	115	70×70	$\pm 28^\circ$	12	16	A	150-1001	420
160	176	110×110	$\pm 28^\circ$	12	26	A	150-1601	420
210	230	145×145	$\pm 28^\circ$	12	34	A	150-2101	420
254	284	175×175	$\pm 28^\circ$	16	31	A	150-2541	420
290	324	200×200	$\pm 28^\circ$	16	31	A	150-2901	420
330	346	220×220	$\pm 28^\circ$	16	40	A	150-3301	420
420	467	300×300	$\pm 28^\circ$	16	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, μ m	Drawing	Catalogue number	Price, EUR
100	115	70×70	$\pm 28^\circ$	12	16	A	150-1002	460
160	186	110×110	$\pm 28^\circ$	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, μ m	Drawing	Catalogue number	Price, EUR
100	126	70×70	$\pm 28^\circ$	7	10	A	150-1003	930
160	199	110×110	$\pm 28^\circ$	7	15	B	150-1603	930

BEST MIRROR PLACES m1/m2 – 24/24 mm, screw size – M85×1

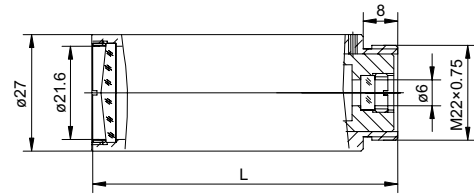
Wavelength – 1064 nm, Lens Diameter – 104 mm

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

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	M22x0.75

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

RELATED PRODUCT

Large Rod Small Mounting Clamp (aluminium) 810-0062A
Find more at EksmaOptics.com



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

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



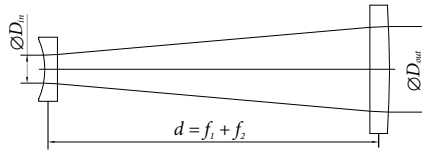
Visit our e-shop www.eksmaoptics.com and find the drawings of all zoom beam expanders.

RELATED PRODUCT

Universal Adjustable Optics Mount 830-0035
Find more at EksmaOptics.com



SIMPLE TELESCOPE KIT



The distance from the second lens to the focal point of the combined lenses is called the back focal length (BFL).

$$BFL = \frac{f_2 \cdot (d - f_1)}{d - (f_1 + f_2)}$$

If the separation distance is equal to the sum of the focal lengths ($d = f_1 + f_2$), the combined focal length and BFL are infinite. This corresponds to a pair of lenses that transform a parallel (collimated) beam into another collimated beam. This type of system is called

an afocal system, since it produces no net convergence or divergence of the beam. Two lenses at this separation form the simplest type of optical telescope. Although the system does not alter the divergence of a collimated beam, it does alter the width of the beam. The magnification of such a telescope is given by

$$M = -\frac{f_2}{f_1} = \frac{D_{out}}{D_{in}} \frac{(\text{exit diameter})}{(\text{input diameter})}$$

which is the ratio of the input beam width to the output beam width. Note the sign convention: a telescope with two convex lenses ($f_1 > 0, f_2 > 0$) produces a negative magnification, indicating an inverted image. A concave plus a convex lens ($f_1 < 0 < f_2$) produces a positive magnification and the image is upright.

Simple lenses are subject to optical aberrations. In many cases these aberrations can be compensated for to a great extent by using a combination of simple lenses with complementary aberrations. A compound lens is a collection of simple lenses of different shapes and made of materials of different refractive indices, arranged one after the other with a common axis.

If two thin lenses are separated in air by some distance d (where d is smaller than the focal length of the first lens), the focal length for the combined system is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 \cdot f_2}$$

Coating	Material	Catalogue number	Price, EUR
Uncoated	BK7	140-0008	771
1064 nm, R<0.2%	BK7	141-0008	1075
532 nm + 1064 nm, R<0.5%	BK7	142-0008	1110
400 – 700 nm, R<0.9%	BK7	147-0008	1260
Uncoated	UV FS	140-1008	1170
266 nm, R<0.4%	UV FS	144-1008	1470
266 nm + 355 nm, R<0.6%	UV FS	149-1008	1480
210 – 400 nm, R<1.5%	UV FS	146-1008	1680
355 nm, R<0.25%	UV FS	143-1008	1465
532 nm + 1064 nm, R<0.5%	UV FS	141-1008	1485
350 – 900 nm, R<1.5%	UV FS	145-1008	1685
650 – 950 nm, R<1%	UV FS	148-1008	1645

Any other antireflection coating wavelength region is available on request.

Each kit includes 8 lenses, Aluminium Optical Rail 810-0005-02, two Aluminium Rail Carriers 810-0007-06, Self Centering Lens Mounts 830-0010 and 830-0020, two Rod Holders 820-0050-02 and two Rods 820-0010-02. Net weight: 1.4 kg

SIMPLE TELESCOPE KIT

Material: BK7		Material: UV FS		Focal length f_1 , mm	Focal length f_2 , mm	Distance between lenses $d=f_1+f_2$, mm *	Magnification, M
Lens 1	Lens 2	Lens 1	Lens 2				
BK7 bi/cv Ø12.7 mm	BK7 pl/cx Ø50.8 mm	UV FS bi/cv Ø12.7 mm	UV FS pl/cx Ø50.8 mm	-12.7	+75	62	5.9
114-0104	110-0502	114-1104	110-1505		+100	87	7.7
	110-0505		110-1509		+150	137	11.8
	110-0507		110-1511		+200	187	15.7
	110-0509		110-1515		+250	237	19.7
	110-0511		110-1517				
BK7 bi/cv Ø25.4 mm	BK7 pl/cx Ø50.8 mm	UV FS bi/cv Ø25.4 mm	UV FS pl/cx Ø50.8 mm	-25	+75	50	3
114-0204	110-0502	114-1204	110-1505		+100	75	4
	110-0505		110-1509		+150	125	6
	110-0507		110-1511		+200	175	8
	110-0509		110-1515		+250	225	10
	110-0511		110-1517				
BK7 pl/cv Ø25.4 mm	BK7 pl/cx Ø50.8 mm	UV FS pl/cv Ø25.4 mm	UV FS pl/cx Ø50.8 mm	-50	+75	25	1.5
112-0209	110-0502	112-1205	110-1505		+100	50	2
	110-0505		110-1509		+150	100	3
	110-0507		110-1511		+200	150	4
	110-0509		110-1515		+250	200	5
	110-0511		110-1517				

* Note that distance between lenses d is the distance between focal planes of the lenses and is given theoretically (the thickness of lenses is not included into calculation). It, also, depends on wavelength. The distance should be adjusted ± 10 mm in each particular case.

GAUSS-TO-TOP HAT BEAM SHAPING LENS

FEATURES

- › Square Top Hat beam profile
- › Efficiency >95 %
- › Top Hat width from 50 μm to several cm



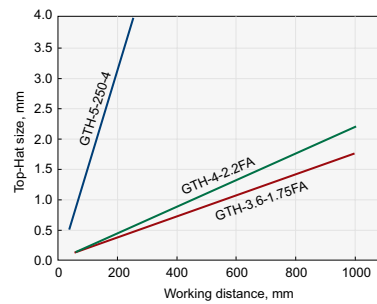
Gauss-to-Top Hat Beam Shaping Lens is a lens of a special form, used to distribute energy of Gaussian beam to Top Hat profile. GTH beam shapers operate within a large wavelength range from VIS to NIR.

Top Hat beam shapers GTH-4-2.2 and GTH-3.6-1.75 work together with nearly any focusing optic. Top Hat profile is generated in the focal plane of this focusing optic. By varying the focal length it is possible to scale Top Hat size and working distance.

GTH-5-250-4 is an exception to the other beam shapers because a focal length of 250 mm is integrated. However, Top Hat size can also be scaled by using additional lenses.

LENS SPECIFICATIONS

Material	LF5 Schott glass n = 1.5659 @ 1060 nm, n = 1.5848 @ 546 nm, n = 1.6192 @ 365 nm
Clear aperture	Ø11.0 mm
Damage threshold (uncoated)	>3 J/cm ² @ 532 nm, 10 ns
Mounting	Mounted into 1" ring holder



Top Hat width in relation to the working distance

GAUSS-TO-TOP-HAT BEAM SHAPING LENS – GTH-5-250-4

Square top hat size and corresponding working distance can be changed by placing an extra lens or objective behind beam shaping lens GTH-5-250-4. Dependence of square size and working distance vs focal length of additional lens or objective:

Focal length, mm	Top hat square size, mm	Working distance, mm
+50	0.67 x 0.67	42
+100	1.1 x 1.1	71
+200	1.8 x 1.8	111
+300	2.2 x 2.2	136
-1000	5.3 x 5.3	333
-500	8.0 x 8.0	500

GTH-5-250-4 OPERATION SPECIFICATIONS

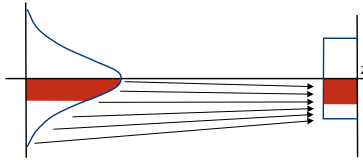
Recommended operation wavelength range	400 – 1500 nm
Input beam	TEM ₀₀ , diameter (1/e ²): 5.0 ± 0.15 mm
Output beam	Top hat size at 250 mm working distance: 4 x 4 mm ² (adjustable with additional lens)
Working distance	250 mm (adjustable with additional lens)
Beam energy distribution efficiency	> 95% of input energy within Top Hat profile
Beam homogeneity	± 5 % (rel. to average intensity within top hat)
Lens diameter	12.0 +0.0/-0.1 mm
Thickness	4.0 ± 0.1 mm

Description	Catalogue number	Price, EUR
Uncoated lens	GTH-5-250-4	565
VIS coated lens (400-700 nm (R<1% per face))	GTH-5-250-4-VIS	620
IR coated lens (700-1300 nm (R<1% per face))	GTH-5-250-4-IR	620

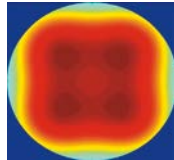
Other specific laser wavelengths are available on request.

GTH-5-250-4 OPERATION INSTRUCTIONS

PRINCIPLES OF BEAM SHAPER OPERATION AND LENS SHAPE

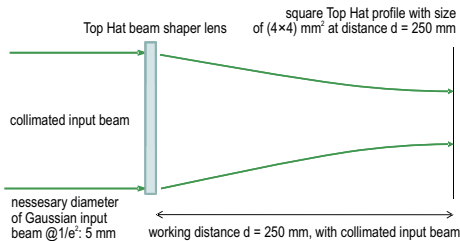


Energy of Gaussian input beam is redistributed to a Top Hat beam profile by beam shaper lens (mapping).



Surface contour plot of beam shaper lens (free form optic).

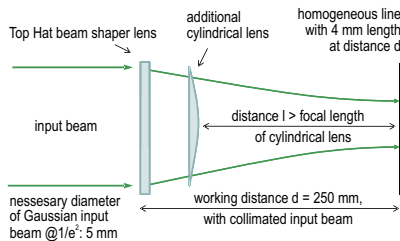
OPTICAL SETUP FOR GAUSS-TO-TOP HAT BEAM SHAPER LENS



If a collimated Gaussian beam is used the Top Hat beam shaper lens delivers at the working distance $d = 250$ mm a square Top Hat beam profile with the size of (4×4) mm².

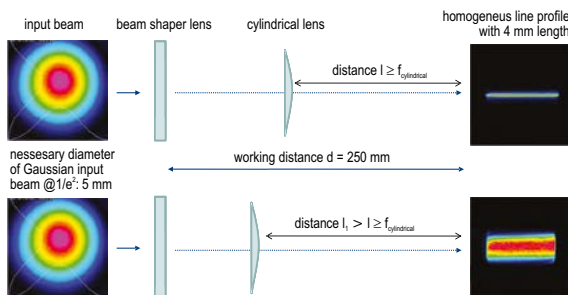
The Top Hat beam shaper lens works also for divergent and convergent Gaussian beams. Important: One has to consider that input beam diameter at beam shaper lens plane must be 5 mm @ $1/e^2$. For divergent (or convergent) beams the size of Top Hat and working distance increase (or decrease).

HOMOGENEOUS LINE GENERATION WITH TOP HAT BEAM SHAPER LENS AND ADDITIONAL CYLINDRICAL LENS



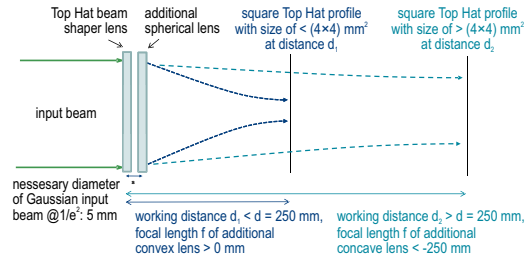
By introducing an additional cylindrical lens behind the Top Hat beam shaper lens (thereby one has to consider that the distance l between cylindrical lenses and working

plane must be bigger or same as focal length of cylindrical lens) it is possible to generate a line profile at working plane. Along the long axis the intensity profile is homogeneous. Along short axis, which is focused by cylindrical lens, the profile is near Gaussian.



By varying the distance l the width of line profile (short axis) can be changed from near diffraction limited size to several millimeters.

ADJUSTMENT OF SQUARE TOP HAT SIZE BY ADDITIONAL SPHERICAL LENS



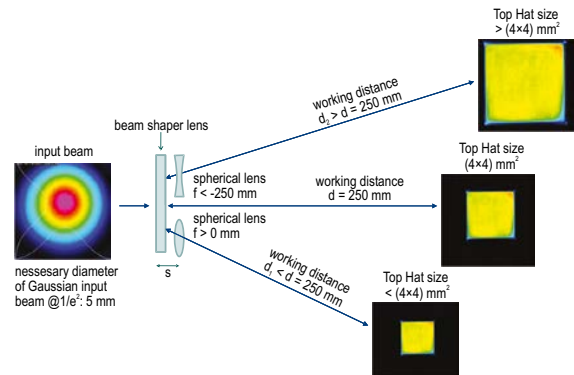
The working distance and the size of the Top Hat profile can be changed (same ratio) by an additional spherical lens. For a convex lens the size of the Top Hat profile and the working distance becomes smaller. For a concave lens the size of the Top Hat profile and the working distance becomes bigger.

The new working distance and the size of the Top Hat profile can be calculated:

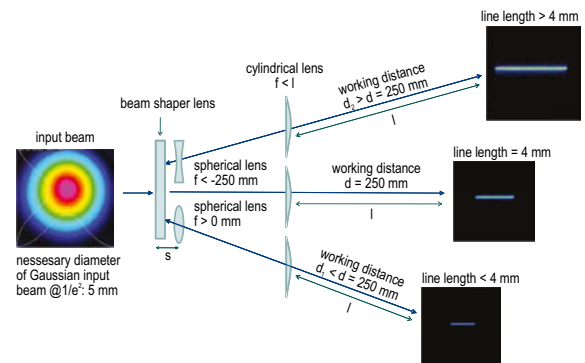
$$\text{Working distance} = \frac{250 \text{ mm} \cdot f}{250 \text{ mm} + f}$$

for focal length $f > 0$ mm (additional convex lens) respectively focal length $f < -250$ mm (additional concave lens); $s > 0$

$$\text{Square Top Hat Size} = \left(\frac{4 \text{ mm} \cdot \text{working distance}}{250 \text{ mm}} \right)^2 = \left(\frac{4 \text{ mm} \cdot f}{250 \text{ mm} + f} \right)^2$$



ADJUSTMENT OF LENGTH OF HOMOGENEOUS LINE BY ADDITIONAL SPHERICAL LENS



GAUSS-TO-TOP-HAT BEAM SHAPING LENS – GTH-4-2.2FA

Working distance of this lens is given by the focal length of an additional lens, which is always needed. For instance if an additional lens $f = 100$ mm is used, Top Hat appears at 100 mm behind additional lens. So GTH-4-2.2FA could be easily put in front of objectives for example. The distance between GTH-4-2.2FA and additional lens is not critical (up to several tens of centimeters). The full fan angle of Top-Hat generation for GTH-4-2.2FA is 2.2 mrad. This leads to Top-Hat sizes:

Focal length, mm	Top hat square size, mm	Working distance, mm
+50	0.11 x 0.11	50
+100	0.22 x 0.22	100
+1000	2.2 x 2.2	1000
+2000	4.4 x 4.4	2000

GTH-4-2.2FA OPERATION SPECIFICATIONS

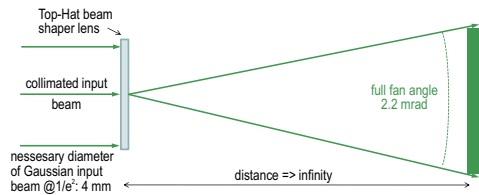
Recommended operation wavelength range	400-1550 nm
Input beam	TEM ₀₀ , diameter (1/e ²): 4.0 ± 0.15 mm
Achievable Top Hat size	6x diffraction limited @ 1064 nm, 12x diffraction limited @ 532 nm
Full fan angle of Top-Hat generation	2.2 mrad
Beam energy distribution efficiency	> 95% of input energy within Top Hat profile
Beam homogeneity	± 5 % (rel. to average intensity within Top Hat)
Lens diameter	12.0 +0.0/-0.1 mm
Lens thickness	4.0 ± 0.1 mm

Description	Catalogue number	Price, EUR
Uncoated lens	GTH-4-2.2FA	565
VIS coated lens (400-700 nm (R<1% per face))	GTH-4-2.2FA-VIS	620
IR coated lens (700-1300 nm (R<1% per face))	GTH-4-2.2FA-IR	620

Other specific laser wavelengths are available on request.

GTH-4-2.2FA OPERATION INSTRUCTIONS

GENERAL FUNCTION OF TOP-HAT BEAM SHAPER GTH-4-2.2FA



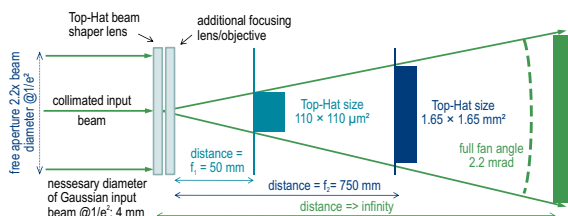
The Top-Hat beam shaper GTH-4-2.2FA is generating a square Top-Hat profile with a full fan angle of 2.2 mrad. To get best results it is necessary to use a Gaussian TEM₀₀ input beam with a diameter of 4 mm @ 1/e². For all setups using GTH beam shaper the user has to consider that the free aperture along the total beam path has to be at least 2.2 (better 2.5) times bigger than the beam diameter @ 1/e².

OPTICAL SETUP FOR TOP-HAT BEAM SHAPER GTH-4-2.2FA

There are different possibilities to integrate the GTH-4-2.2 beam shaper into an optical setup.

1. Beam shaper directly in front of focusing optic/objective (Top Hat size > 100 µm).

Top Hat size is determined by focal length (f) of focusing optic/objective and can be calculated as follows: $\frac{2.2}{1000} \cdot f$



By introducing the GTH-4-2.2FA into the beam path in front of a lens/objective the initial diffraction limited Gaussian spot will be transformed into a square homogeneous Top-Hat profile.

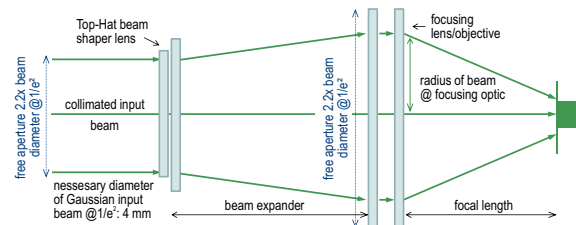
The necessary beam diameter at the position of GTH-4-2.2FA is 4 mm @ 1/e².

The resulting Top-Hat size is given by: $\frac{2.2}{1000} \cdot \text{focal length}$, for example with $f = 50$ mm $\Rightarrow 110$ µm.

2. Beam shaper in front of beam expander (Top Hat size < 100 µm)

Top Hat size is determined by numerical aperture (NA) of focused beam and can be calculated as follows:

$$\approx \frac{4 \mu\text{m}}{\text{NA}} \Rightarrow \approx 6x \text{ diffraction limited @ } 1064 \text{ nm (12x @ } 532 \text{ nm)}$$



To achieve Top Hat sizes smaller than 100 µm it's recommended to introduce the GTH-4-2.2FA into the beam path in front of a beam expander. Initially the necessary input beam diameter of 4 mm @ 1/e² is passing the GTH. Afterwards the beam is expanded and focused on working plane. The initial diffraction limited Gaussian spot at focal plane will be transformed into a square homogeneous Top-Hat profile. The resulting Top-Hat size is given by:

$$\approx \frac{4 \mu\text{m}}{\text{NA}} \Rightarrow \approx 6x \text{ diffraction limited @ } 1064 \text{ nm (12x @ } 532 \text{ nm)}$$

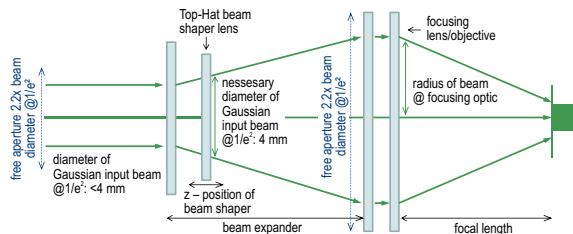
NA represents the numerical aperture of focused beam and is given by:

$$NA = \frac{\text{beam radius @ focusing optic}}{\text{focal length of focusing optic}}$$

3. Beam shaper within beam expander (Top Hat size <100 μm)

Top Hat size is determined by numerical aperture (NA) of focused beam and can be calculated as follows:

$$\approx \frac{4 \mu\text{m}}{NA} \Rightarrow \approx 6x \text{ diffraction limited @ } 1064 \text{ nm (12x @ } 532 \text{ nm)}$$



A further and even more flexible possibility is to introduce GTH-4-2.2FA 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 GTH-4-2.2FA by shifting shaper along z-axis. It's just necessary to consider that the beam diameter at the position of GTH is 4 mm @ 1/e². The resulting Top-Hat size is given by:

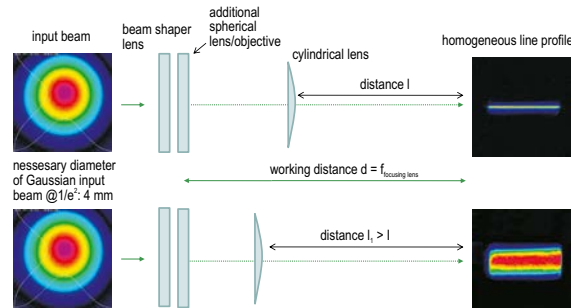
$$\approx \frac{4 \mu\text{m}}{NA} \Rightarrow \approx 6x \text{ diffraction limited @ } 1064 \text{ nm (12x @ } 532 \text{ nm)}$$

NA represents the numerical aperture of focused beam and is given by:

$$NA = \frac{\text{beam radius @ focusing optic}}{\text{focal length of focusing optic}}$$

HOMOGENEOUS LINE GENERATION WITH ADDITIONAL CYLINDRICAL LENS

Line thickness fixed, near diffraction limited.



If an additional cylindrical lens is used, one can generate homogeneous line profiles. By varying the distance l the width of line profile (short axis) can be changed from near diffraction limited size to several millimeters. We recommend the use of a cylindrical lens with a focal length of f = 2.25 m.

GAUSS-TO-TOP-HAT BEAM SHAPING LENS – GTH-3.6-1.75FA

Working distance of this lens is given by the focal length of an additional lens, which is always needed.

For instance if an additional lens f = 100 mm is used, Top Hat appears at 100 mm behind additional lens. So GTH-3.6-1.75FA could be easily put in front of objectives for example.

The distance between GTH-3.6-1.75FA and additional lens is not critical (up to several tens of centimeters).

The full fan angle of Top-Hat generation for GTH-3.6-1.75FA is 1.75 mrad. This leads to Top-Hat sizes:

Focal length, mm	Top hat square size, mm	Working distance, mm
+50	0.088 x 0.088	50
+100	0.175 x 0.175	100
+1000	1.75 x 1.75	1000

GTH-3.6-1.75FA OPERATION SPECIFICATIONS

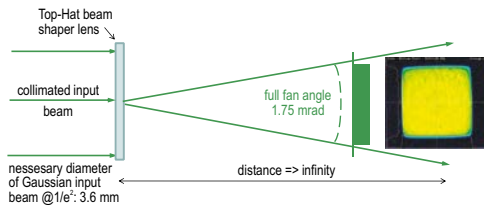
Recommended operation wavelength range	400-1550 nm
Necessary free aperture	always 2.2x beam diameter @ 1/e², along total beam path
Input beam	TEM ₀₀ , diameter (1/e²): 3.6 ± 0.15 mm
Achievable Top Hat size @ 1/e²	5x diffraction limited @ 1064 nm, 10x diffraction limited @ 532 nm
Full fan angle of Top-Hat generation	1.75 mrad
Beam energy distribution efficiency	> 95% of input energy within Top Hat profile
Beam homogeneity	± 5 % (rel. to average intensity within Top Hat)
Lens diameter	12.0 +0.0/-0.1 mm
Lens thickness	2.0 ± 0.1 mm

Description	Catalogue number	Price, EUR
Uncoated lens	GTH-3.6-1.75FA	565
VIS coated lens (400-700 nm (R<1% per face))	GTH-3.6-1.75FA-VIS	620
IR coated lens (700-1300 nm (R<1% per face))	GTH-3.6-1.75FA-IR	620

Other specific laser wavelengths are available on request.

GTH-3.6-1.75FA OPERATION INSTRUCTIONS

GENERAL FUNCTION OF TOP-HAT BEAM SHAPER GTH-3.6-1.75FA



The Top-Hat beam shaper GTH-3.6-1.75FA is generating a square Top-Hat profile with a full fan angle of 1.75 mrad. To get the best results it is necessary to use a Gaussian TEM₀₀ input beam with a diameter of 3.6 mm @ 1/e².

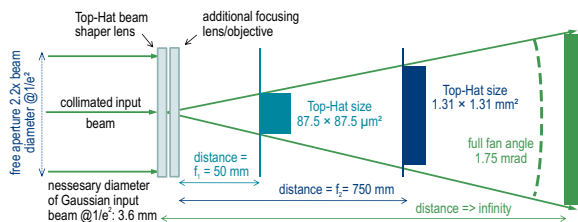
For all setups using GTH beam shaper the user has to consider that the free aperture along the total beam path has to be at least 2.2 (better 2.5) times bigger than the beam diameter @ 1/e².

OPTICAL SETUP FOR TOP-HAT BEAM SHAPER GTH-3.6-1.75FA

There are different possibilities to integrate the GTH-3.6-1.75FA beam shaper into an optical setup.

1. Beam shaper directly in front of focusing optic/objective (Top Hat size @ 1/e² > 90 μm).

Top Hat size is determined by focal length (f) of focusing optic/objective and can be calculated as follows: $\frac{1.75}{1000} \cdot f$



By introducing the GTH-3.6-1.75FA into the beam path in front of a lens/objective the initial diffraction limited Gaussian spot will be transformed into a square homogeneous Top-Hat profile.

The necessary beam diameter at the position of GTH-3.6-1.75FA is 3.6 mm @ 1/e².

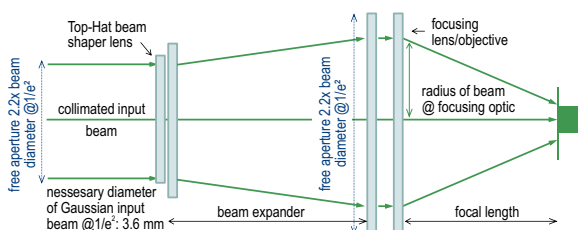
The resulting Top-Hat size is given by: $\frac{1.75}{1000} \cdot \text{focal length}$, for example with f = 50 mm => 87.5 μm.

2. Beam shaper in front of beam expander

(Top Hat size @ 1/e² < 90 μm).

Top Hat size is determined by numerical aperture (NA) of focused beam and is given by:

$$\approx \frac{3.2 \mu\text{m}}{\text{NA}} \Rightarrow \approx 5x \text{ diffraction limited @ } 1064 \text{ nm (10x @ } 532 \text{ nm)}$$



To achieve Top Hat sizes smaller than 90 μm it's recommended to introduce the GTH-3.6-1.75FA into the beam path in front of a beam expander. Initially the necessary input beam diameter of 3.6 mm @ 1/e² is passing the GTH. Afterwards the beam is expanded and focused on working plane. The initial diffraction limited Gaussian spot at focal plane will be transformed into a square homogeneous Top-Hat profile. The resulting Top-Hat size is given by:

$$\approx \frac{3.2 \mu\text{m}}{\text{NA}} \Rightarrow \approx 5x \text{ diffraction limited @ } 1064 \text{ nm (10x @ } 532 \text{ nm)}$$

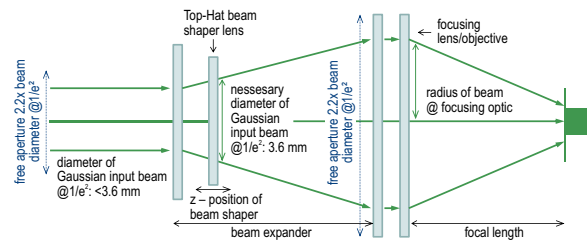
NA represents the numerical aperture of focused beam and is given by:

$$\text{NA} = \frac{\text{beam radius @ focusing optic}}{\text{focal length of focusing optic}}$$

3. Beam shaper within beam expander (Top Hat size @ 1/e² < 90 μm).

Top Hat size is determined by numerical aperture (NA) of focused beam and is given by:

$$\approx \frac{3.2 \mu\text{m}}{\text{NA}} \Rightarrow \approx 5x \text{ diffraction limited @ } 1064 \text{ nm (10x @ } 532 \text{ nm)}$$



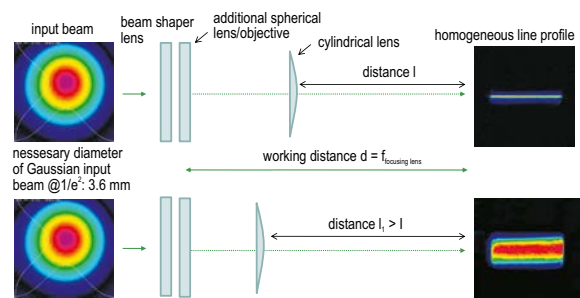
A further and even more flexible possibility is to introduce GTH-3.6-1.75FA into the beam path within a beam expander. The user has the possibility for an easy "fine tuning" of beam diameter at the position of GTH-3.6-1.75FA by shifting shaper along z-axis. It's just necessary to consider that the beam diameter at the position of GTH is 3.6 mm @ 1/e². The resulting Top-Hat size is given by:

$$\approx \frac{3.2 \mu\text{m}}{\text{NA}} \Rightarrow \approx 5x \text{ diffraction limited @ } 1064 \text{ nm (10x @ } 532 \text{ nm)}$$

NA represents the numerical aperture of focused beam and is given by:

$$\text{NA} = \frac{\text{beam radius @ focusing optic}}{\text{focal length of focusing optic}}$$

HOMOGENEOUS LINE GENERATION WITH ADDITIONAL CYLINDRICAL LENS



If an additional cylindrical lens is used, one can generate homogeneous line profiles. By varying the distance l the width of line profile (short axis) can be changed from near diffraction limited size to several millimeters. We recommend the use of a cylindrical lens or lens system with a focal length of = 1.8 m.

TOP HAT BEAM SHAPING LENS FROM UVFS – FBS

FEATURES

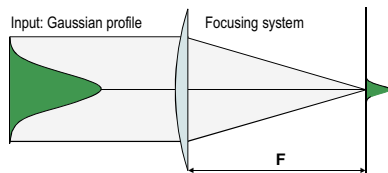
- New Diffractive Beam Shaping Concept based on Fourier methods
- Transforming Gaussian TEM₀₀ beam into square or round homogeneous Top-Hat profile
- Top Hat size is near diffraction limited and is given by: $\sim \lambda/NA$
- Achievable Top Hat sizes: 1 – 200 μm

SPECIFICATIONS

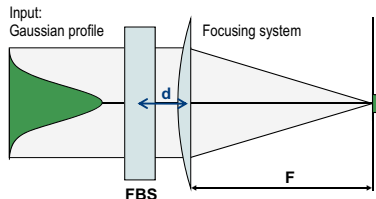
Material	fused silica	
Diameter	25.4 mm	tolerance ± 0.1 mm
Input Beam	TEM ₀₀ , different models for diameter@ $1/e^2$: 2.0 ... 10.0 mm with 0.5 mm step	tolerance $\pm 5\%$
Necessary Free Aperture	2.2x (or better 2.5x) beam diameter@ $1/e^2$	along total beam path
Top Hat Size	1.5x diffraction limited Gaussian spot	square form (round optional)
Homogeneity	$\pm 2.5\%$	rel. to average intensity within tophat
Wavelength	different models for: 1064 nm, 532 nm or 355 nm	others on request
Transmission	> 99%	AR/AR coating
Efficiency	> 90%	of input energy within tophat profile
Damage Threshold	4 J/cm ² @ 532 nm, 10 ns	
Free Aperture	23 mm	

FBS OPERATION INSTRUCTIONS

FBS – TOP-HAT FUNDAMENTAL BEAM MODE SHAPER



Without FBS Beam Shaper: Gaussian-profile at focal plane



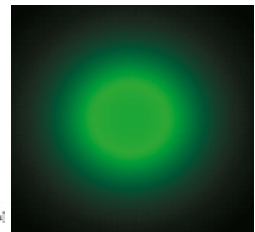
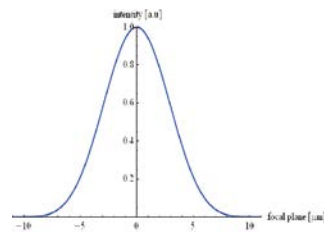
With FBS Beam Shaper: Top-Hat-profile at focal plane

- FBS works together with focusing system (FS)
- Top Hat size just depends on wavelength (λ) and numerical aperture (NA) of focused beam
- Distance d between FBS and FS up to several meters

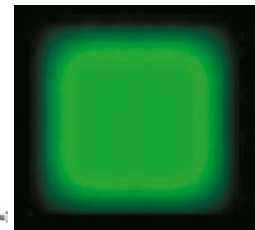
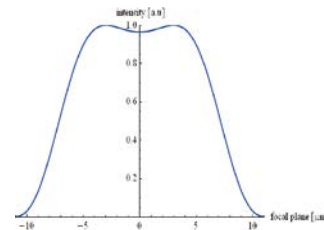
INTENSITY DISTRIBUTION AT FOCAL PLANE

Main FBS advantages:

- Smallest achievable Top-Hat size: $\approx$ always 1.5x of diffraction limited Gaussian-spot @ $1/e^2$
- Achievable Top Hat profiles: square or round
- Diffraction efficiency: > 95% of energy in Top Hat
- Homogeneity: modulation $< \pm 2.5\%$
- Depth of focus: similar as for Gaussian beam
- Insensitive to misalignment, ellipticity and input diameter variation: $\pm 5\text{-}10\%$



Without FBS shaper: diffraction limited Gaussian profile



With FBS shaper: near diffraction limited Top Hat profile

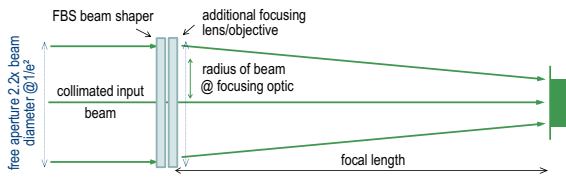
OPTICAL SETUP FOR FBS TOP-HAT BEAM SHAPER

Independent of optical setup the user has to consider that:

- The free aperture along the total beam path has to be at least 2.2x (better 2.5x) bigger than the beam diameter @ $1/e^2$
- The Top Hat size is always given by: $\frac{\lambda}{NA}$
 λ is the used wavelength;
 NA is the numerical aperture
 of focused beam and is given by: $\frac{\text{beam radius @ focusing optic}}{\text{focal length of focusing optic}}$

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

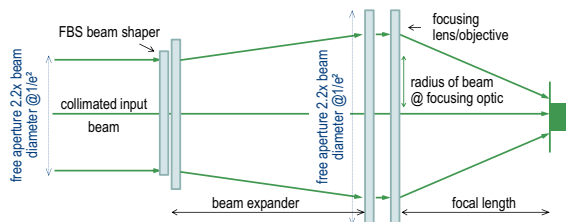


By introducing the FBS beam shaper into the beam path in front of a lens/objective the initial diffraction limited Gaussian spot will be transformed into a homogeneous Top-Hat profile.

When a Gaussian TEM_{00} input beam with a diameter of 5 mm @ $1/e^2$ 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 TEM_{00} input beam with a diameter of 5 mm @ $1/e^2$ and a focusing lens with $f=160$ mm is used, ones will get a homogeneous Top Hat profile with a diameter of 34 μ m.

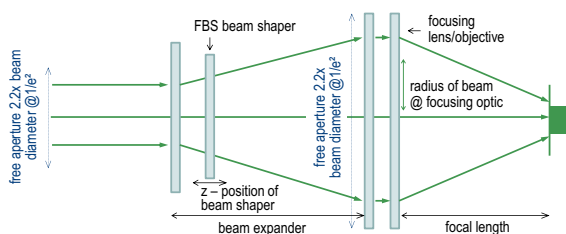
2. Beam shaper in front of a beam expander



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.

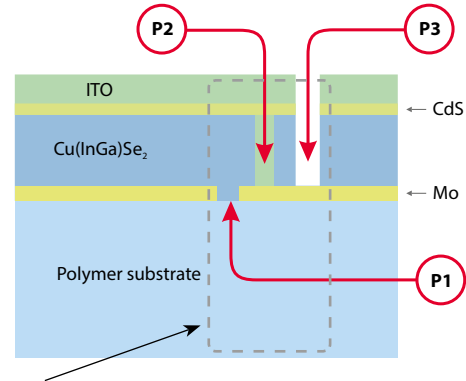
Example: A Gaussian beam with a diameter of 5 mm @ $1/e^2$ illuminates the FBS beam shaper and is afterwards increased by a beam expander to a beam diameter of 8 mm. With an focusing optic with $f=50$ mm the user can generate a Top Hat with a diameter of 7 μ m. The needed free aperture increases with 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



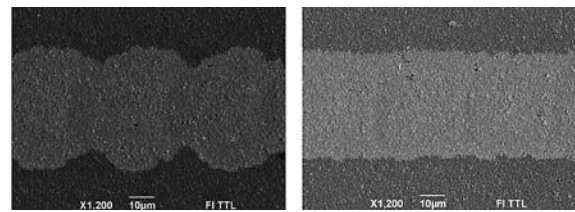
A further and even more flexible possibility is to introduce the FBS beam shaper into the beam path within a beam expander. The user has the possibility for an easy "fine tuning" of beam diameter at the position of FBS beam shaper by shifting shaper along z-axis.

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“



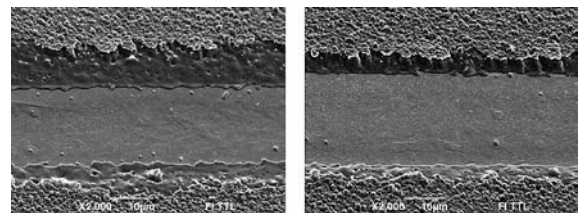
Gaussian Profile

FBS-Top-Hat Profile

small overlap, smooth edges

Removal of a front contact in ZnO(1 μ m)/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 μ m)/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 5.4



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	Ts/Tp < 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	1030
700-1000	2 ²⁾	990-0060-11IR	1030

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	Ts/Tp < 1:500
Clear aperture	11 mm

Central wavelength, nm	LDT, J/cm ² *	Catalogue number	Price, EUR
1064	15	990-0061-11	710
1030	15	990-0062-11	710
800	8	990-0063-11	710
532	6	990-0064-11	710
355	3	990-0065-11	740

* LDT measured at designed wavelength, 10 Hz, 10 ns pulses.

VARIABLE ATTENUATORS FOR LINEARLY POLARIZED LASER BEAM – 990-0070

FEATURES

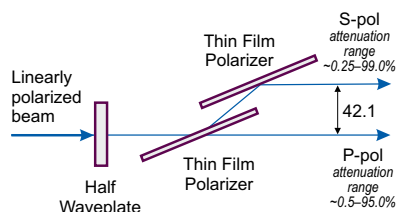
- › Divides laser beam into two parallel beams of manually adjustable intensity ratio
- › Large dynamic range
- › Transmitted beam shift ~ 0.5 mm
- › High optical damage threshold



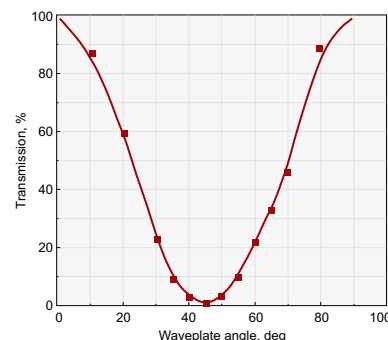
Note: Movable base **820-0090**, Rod Holder **820-0050-02** and standard rod should be ordered separately.

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 reflect 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 *	1020
355	990-0070-355	750
532	990-0070-532	650
1064	990-0070-1064	650

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
Time dispersion	t<4 fs for 100 fs Ti:Sapphire laser pulses
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	945
266	990-0070-266	945
343	990-0070-343	840
400	990-0070-400	740
390-410	990-0070-400B	890
515	990-0070-515	740
505-525	990-0070-515B	890
800	990-0070-800	740
780-820	990-0070-800B	890
1030	990-0070-1030	740
1010-1050	990-0070-1030B	890

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

FOR HIGH POWER FEMTOSECOND LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257H	1020
266	990-0070-266H	1020
343	990-0070-343H	915
400	990-0070-400H	815
390-410	990-0070-400HB	965
515	990-0070-515H	815
505-525	990-0070-515HB	965
800	990-0070-800H	815
780-820	990-0070-800HB	965
1030	990-0070-1030H	815
1010-1050	990-0070-1030HB	965

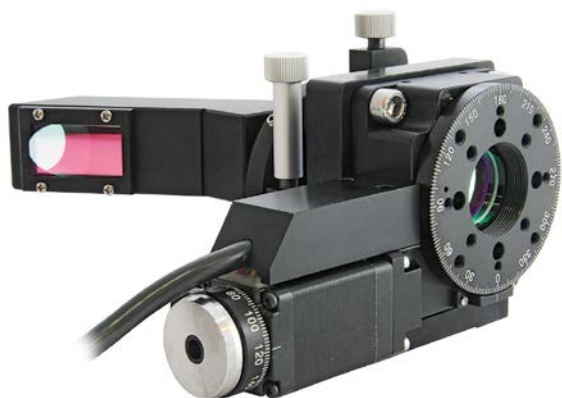
Zero Order Air-Spaced half waveplate is housed in rotating holder 840-0197 for high power femtosecond applications (laser damage threshold: >100 mJ/cm², 50 fsec pulse, 800 nm typical).

RELATED PRODUCTS

Beam dumps
990-0800,
990-0820
See page 5.22



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 reflect 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 600 EUR to price.

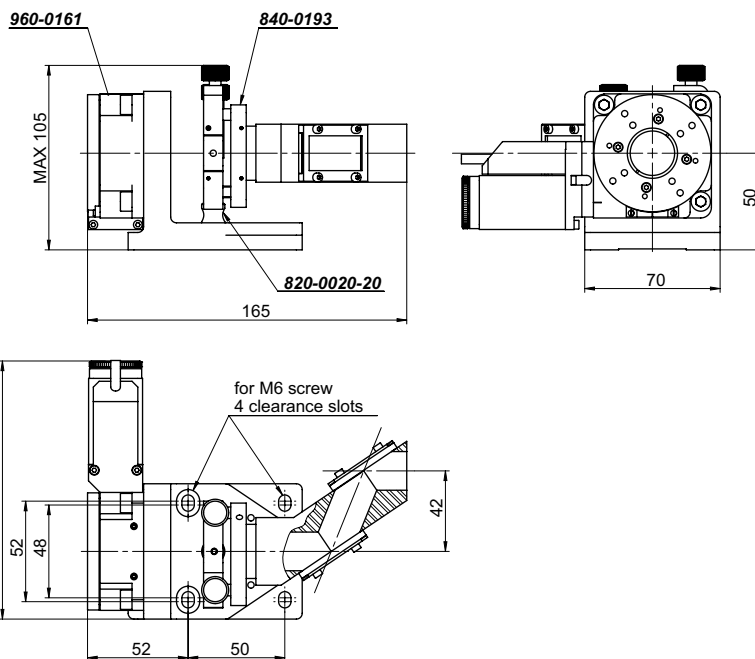
Example:

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

Price – 1725 EUR

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

Price – 2325 EUR



FOR Nd:YAG LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0070-266HM *	1800
355	990-0070-355M	1530
532	990-0070-532M	1430
1064	990-0070-1064M	1430

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	1725
266	990-0070-266M	1725
343	990-0070-343M	1620
400	990-0070-400M	1520
390-410	990-0070-400BM	1670
515	990-0070-515M	1520
505-525	990-0070-515BM	1670
800	990-0070-800M	1520
780-820	990-0070-800BM	1670
1030	990-0070-1030M	1520
1010-1050	990-0070-1030BM	1670

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 fsec pulse, 800 nm typical).

FOR HIGH POWER FEMTOSECOND APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
257	990-0070-257HM	1800
266	990-0070-266HM	1800
343	990-0070-343HM	1695
400	990-0070-400HM	1595
390-410	990-0070-400HBM	1745
515	990-0070-515HM	1595
505-525	990-0070-515HBM	1745
800	990-0070-800HM	1595
780-820	990-0070-800HBM	1745
1030	990-0070-1030HM	1595
1010-1050	990-0070-1030HBM	1745

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 fsec 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



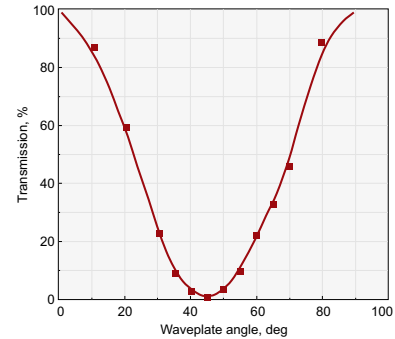
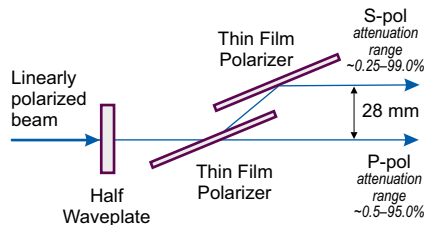
This variable attenuator/beamsplitter consists of a special design opto-mechanical adapter and a precision opto-mechanical holder 840-0197. Two thin film polarizers, operating at AOI=70° and reflecting s-polarized light while transmitting p-polarized light, are housed into the adapter. A quartz zero 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 fsec, 50 Hz
Polarization contrast (after 1st polarizer)	>1:200
Polarization contrast (after 2nd polarizer)	>1:500

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 600 EUR to price.

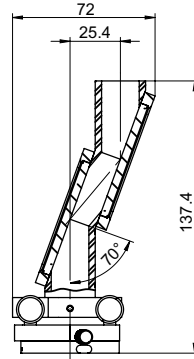
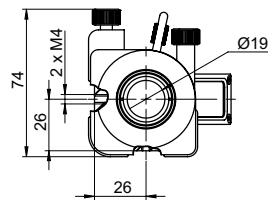
Example:

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

Price – 2050 EUR

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

Price – 2650 EUR



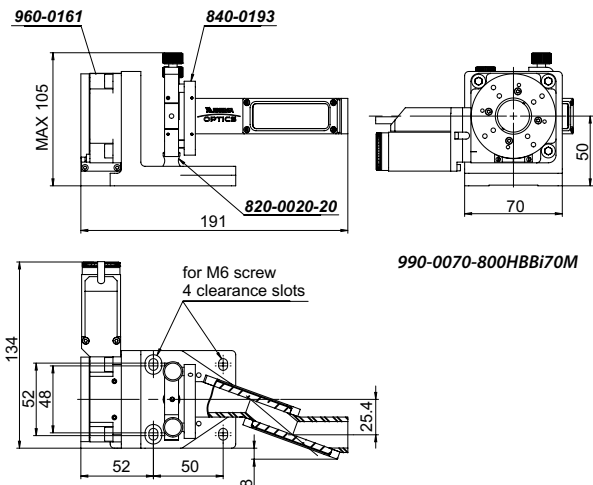
990-0070-800HBBi70

MANUAL ATTENUATORS

Wavelength, nm	Catalogue number	Price, EUR
750-850	990-0070-800HBBi70	1270
980-1080	990-0070-1030HBBi70	1270

MOTORIZED ATTENUATORS

Wavelength, nm	Catalogue number	Price, EUR
750-850	990-0070-800HBBi70M	2050
980-1080	990-0070-1030HBBi70M	2050



VARIABLE ATTENUATORS FOR LINEARLY POLARIZED LASER BEAM – 990-0071

FEATURES

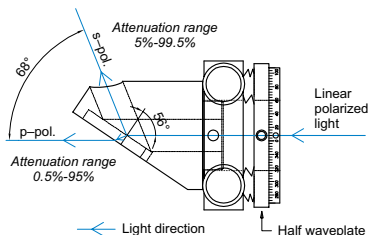
- › Divides laser beam into separated by 68° angle two beams of manually adjustable intensity ratio
- › Large dynamic range
- › Transmitted beam shift ~0.5 mm
- › High Optical damage threshold



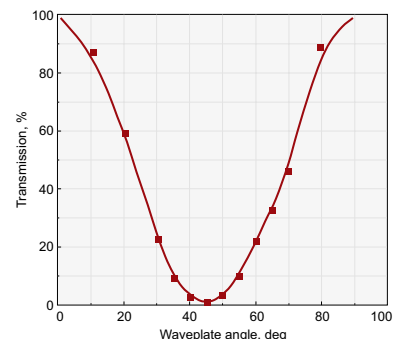
Note: Solid Base Height Extender **820-0210** and Standard Rod **820-0020-20** should be ordered separately

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 reflect 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	445
1064	990-0071-1064	445

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 fsec pulse, 800 nm typical
Time dispersion	t<4 fs for 100 fs Ti:Sapphire laser pulses
Polarization Contrast	>1:200
Weight	0.25 kg

FOR FEMTOSECOND APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
257	990-0071-257	625
266	990-0071-266	625
343	990-0071-343	600
400	990-0071-400	550
390-410	990-0071-400B	650
515	990-0071-515	550
505-525	990-0071-515B	650
800	990-0071-800	550
780-820	990-0071-800B	650
1030	990-0071-1030	550
1010-1050	990-0071-1030B	650

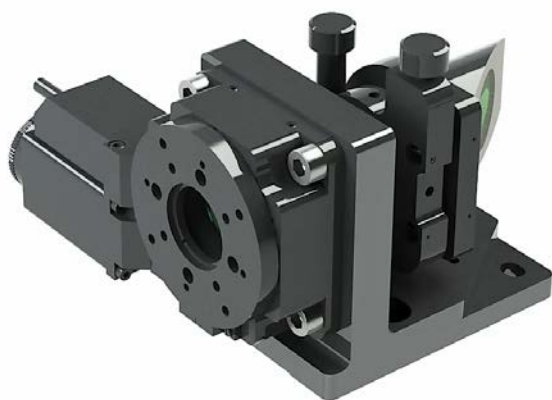
Zero order optically contacted half waveplate is housed in rotating holder 840-0197 for femtosecond laser pulses (laser damage threshold: >10 mJ/cm², 50 fs pulse at 800 nm, typical).

FOR HIGH POWER FEMTOSECOND LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
257	990-0071-257H	690
266	990-0071-266H	690
343	990-0071-343H	665
400	990-0071-400H	615
390-410	990-0071-400HB	715
515	990-0071-515H	615
505-525	990-0071-515HB	715
800	990-0071-800H	615
780-820	990-0071-800HB	715
1030	990-0071-1030H	615
1010-1050	990-0071-1030HB	715

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 fsec 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 reflect 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 600 EUR to price.

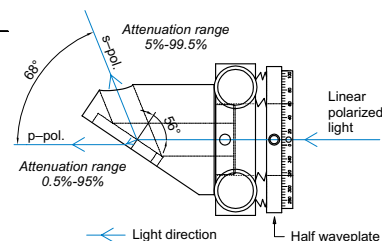
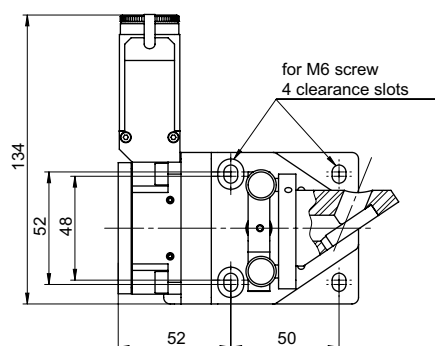
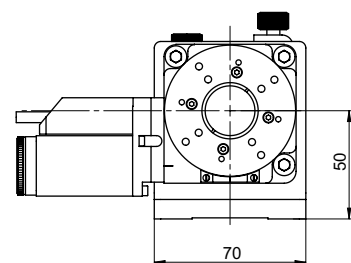
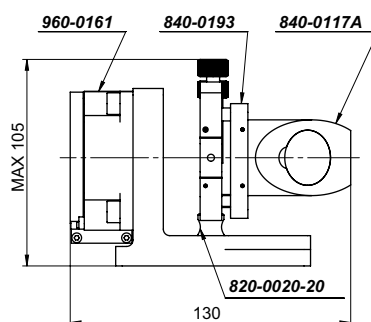
Example:

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

Price – 1405 EUR

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

Price – 2005 EUR



FOR Nd:YAG LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266HM *	1470
355	990-0071-355M	1260
532	990-0071-532M	1230
1064	990-0071-1064M	1230

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	1405
343	990-0071-343M	1380
400	990-0071-400M	1330
390 – 410	990-0071-400BM	1430
515	990-0071-515M	1330
505 – 525	990-0071-515BM	1430
800	990-0071-800M	1330
780 – 820	990-0071-800BM	1430
1030	990-0071-1030M	1330
1010 – 1050	990-0071-1030BM	1430

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 fsec pulse, 800 nm typical).

FOR HIGH POWER FEMTOSECOND LASER APPLICATIONS

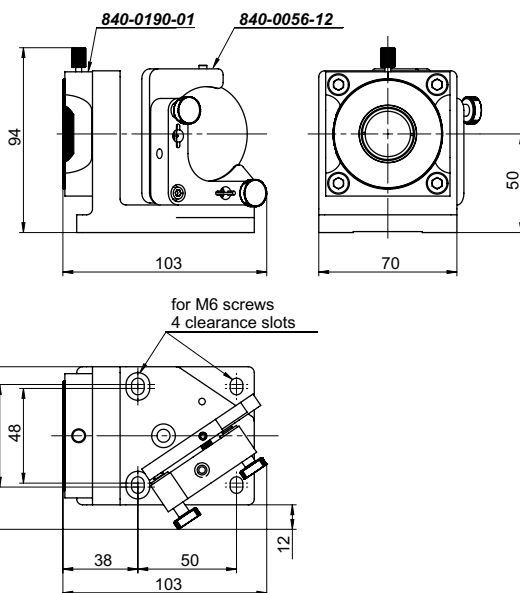
Wavelength, nm	Catalogue number	Price, EUR
266	990-0071-266HM	1470
343	990-0071-343HM	1445
400	990-0071-400HM	1395
390 – 410	990-0071-400HBM	1495
515	990-0071-515HM	1395
505 – 525	990-0071-515HBM	1495
800	990-0071-800HM	1395
780 – 820	990-0071-800HBM	1495
1030	990-0071-1030HM	1395
1010 – 1050	990-0071-1030HBM	1495

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 fsec 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



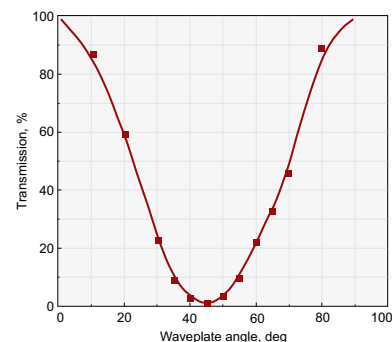
This variable attenuator/beamsplitter consists of Polarizer Holder 840-0190-01 and Kinematic Mirror/Beamsplitter Mount 840-0056-12.

UVFS Thin Film Brewster type polarizer diameter 50.8 mm, which reflect 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.

The holder 840-0056-12 allows to adjust Angle Of Incidence of the Thin Film Brewster type polarizers by $\pm 4.5^\circ$ and to get the maximum extinction contrast. The mounts are on rods, rod holders and Movable Base 820-0090. The optical axis height from the table top can be adjusted in the range 78-88 mm. Other height can be offered as custom changing the standard rods and rod holders into higher.



FOR Nd:YAG LASER APPLICATIONS

Clear Aperture diameter	22 mm
Damage threshold	>5 J/cm ² , 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 *	1085
355	990-0072-355	765
532	990-0072-532	735
1064	990-0072-1064	755

* 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/cm ² , 50 fs pulse at 800 nm, typical
for high power applications	>100 mJ/cm ² , 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	950
343	990-0072-343	895
400	990-0072-400	865
515	990-0072-515	865
800	990-0072-800	880
780 – 820	990-0072-800B	980
1030	990-0072-1030	890
1010 – 1050	990-0072-1030B	980

FOR HIGH POWER FEMTOSECOND LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0072-266H	1085
343	990-0072-343H	1030
400	990-0072-400H	1000
515	990-0072-515H	1000
800	990-0072-800H	1015
780 – 820	990-0072-800HB	1115
1030	990-0072-1030H	1025
1010 – 1050	990-0072-1030HB	1115

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

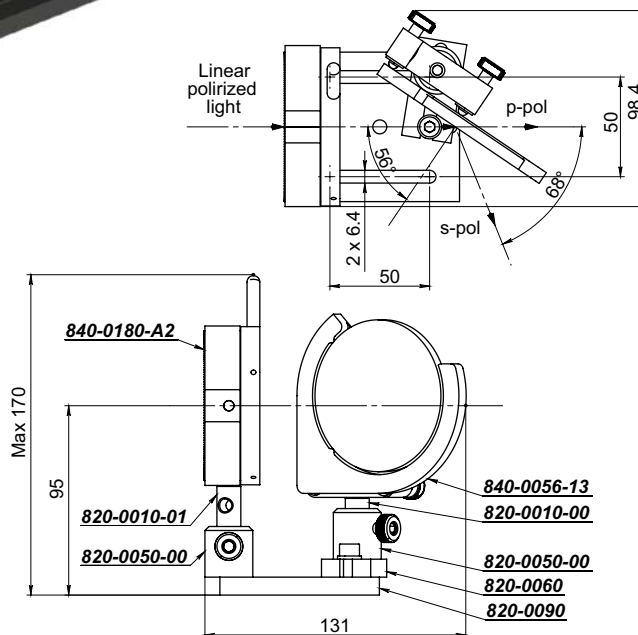
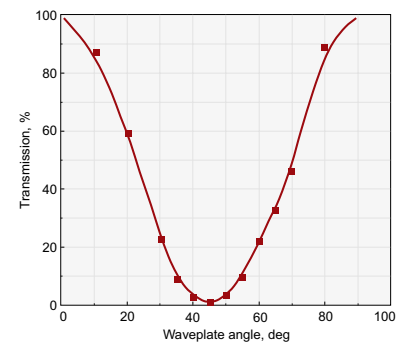


This variable attenuator/beamsplitter consists of Polarizer Holder 840-0180-A2 and Kinematic Mirror/Beamsplitter Mount 840-0056-13. UVFS Thin Film Brewster type polarizer Ø76.2 mm, which reflect s-polarized light while transmitting p-polarized light, is housed into Beamsplitter Mount 840-0056-13. A quartz 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.

The holder 840-0056-13 allows to adjust Angle Of Incidence of the Thin Film Brewster type polarizers by $\pm 4.5^\circ$ and to get the maximum extinction contrast. The mounts are on rods, rod holders and Movable Base 820-0090. The optical axis height from the table top can be adjusted in the range 92-98 mm. Other height can be offered as custom changing the standard rods and rod holders into higher.



FOR Nd:YAG LASER APPLICATIONS

Clear Aperture diameter	36 mm
Damage threshold	>5 J/cm ² , 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 *	1790
355	990-0073-355	1460
532	990-0073-532	1440
1064	990-0073-1064	1515

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

FOR FEMTOSECOND APPLICATIONS

Clear Aperture diameter	36 mm
Damage threshold	>10 mJ/cm ² , 50 fs pulse at 800 nm, typical
for high power applications	>100 mJ/cm ² , 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 FEMTOSECOND APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266	1690
343	990-0073-343	1560
400	990-0073-400	1540
515	990-0073-515	1540
800	990-0073-800	1560
780 – 820	990-0073-800B	1790
1030	990-0073-1030	1615
1010 – 1050	990-0073-1030B	1850

FOR HIGH POWER FEMTOSECOND LASER APPLICATIONS

Wavelength, nm	Catalogue number	Price, EUR
266	990-0073-266H	1790
343	990-0073-343H	1660
400	990-0073-400H	1640
515	990-0073-515H	1640
800	990-0073-800H	1660
780 – 820	990-0073-800HB	1890
1030	990-0073-1030H	1715
1010 – 1050	990-0073-1030HB	1950

FILTERS HOLDER WITH 90° FLIP – 990-0400

FEATURES

- Allows stacking of 5 filters of Ø25.4 mm (1"), or 3 filters of Ø50.8 (2")
- Fast flipping in and out of beam path
- Available to be used in 90° position
- Has one M4, two M6 and two holes Ø6.4mm for mounting on posts or table bases
- Large aperture allows to attenuate large diameter laser beam
- Black Anodized Aluminium and Brass screws



990-0415



990-0423

The holder of 1 inch filters 990-0415 allows the fixation of up to 5 filters into 1 inch optics ring holders. The thickness of optical filters (or any other optical elements) to be held is from 0.5 mm to 8.0 mm. Filters can be easily replaced in ring holders. This filter holder allows fast filter removal from beam path flipping it at 90° position. Any position of filters can be fixed with fixing screw. The firm 0° position can be fixed with the second brass screw (included).

The holder of 2 inch filters 990-0423 allows the fixation of up to 3 filters into 2 inch optics ring holders. The thickness of optical filters (or any other optical elements) to be held is from 0.5 mm to 14.0 mm.

Acceptable filters number	Suitable filters diameter, mm	Clear aperture diameter, mm	Weight, kg	Catalogue number	Price, EUR
5	25.4	23	0.16	990-0415	155
5	25.4	23	0.19	990-0415ND	250
3	50.8	48	0.22	990-0423	145

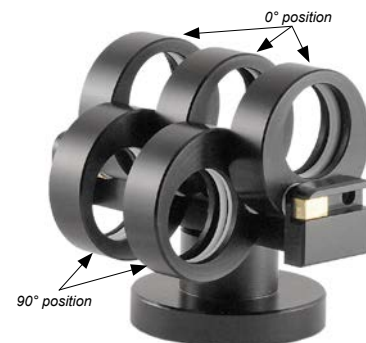
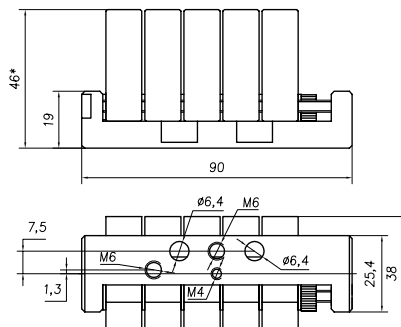
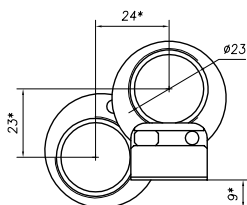
990-0415 at 0° position
(Note: Solid base height extender 820-0210 should be ordered separately)

The holder 990-0415ND is the same holder 990-0415 but with Neutral Density filters that operates as step energy attenuator and allows adjusting transmission from 100% (all 5 filters are at 90° position) till 0.015% (all 5 filters are at 0° position) at visible region. If you need other adjustment you can choose any other Neutral Density filter Ø25.4 mm.

Using the holder 990-0415 with various color glass or dielectric filters various transmitted band pass regions can be achieved. The Filters Holder with 90° Flip is made of black anodized aluminium and brass screws.



990-0423 at 0° position
(Note: Solid base height extender should be ordered separately)



990-0415 at 0° or 90° position
(Note: Solid base height extender 820-0210 should be ordered separately)

RELATED PRODUCTS

Neutral Density Filters Ø25.4 mm

See page 1.14

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 .

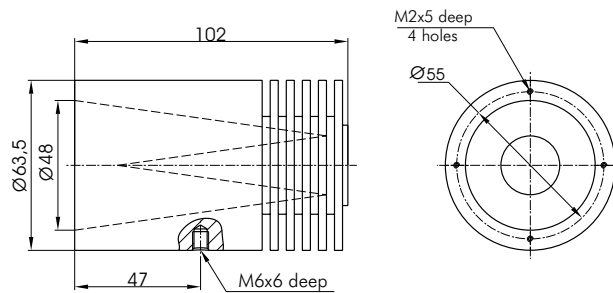
Due to the design of the beam dump, even if the non-reflective coating is damaged by high intensity pulses, there is no backward reflection.

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 .

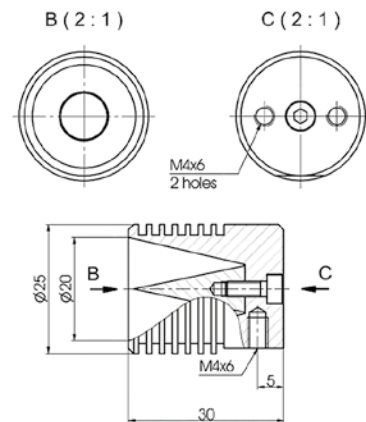
SPECIFICATIONS

Wavelength range	0.1 – 30 μm
Laser type	pulsed, CW

Aperture	Description	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.

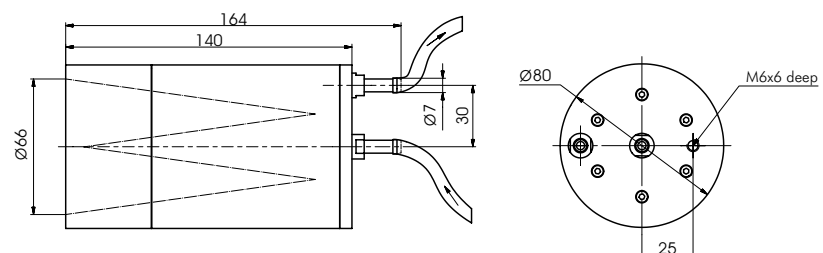
The dump is best suited for beams of up to 1 kW from 0.1 – 30 μm wavelength range. Even if the non-reflective coating is damaged by high intensity pulses, the beam is not reflected back into your optical scheme.

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	239



Optical Tables

OPTICAL
COMPONENTS

NONLINEAR & LASER
CRYSTALS

ND:YAG LASERLINE
COMPONENTS

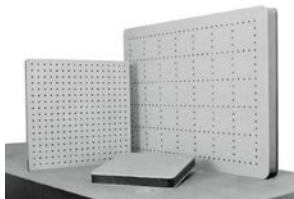
FEMTOLINE
COMPONENTS

OPTICAL
SYSTEMS

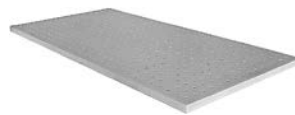
OPTO-MECHANICAL
COMPONENTS



Honeycomb Table Tops
720 – 740



Honeycomb Breadboards
704 – 712



Aluminium Breadboards
715



Solid steel Breadboard
716



Pneumatic Vibration Isolation
System 740



Pneumatic Vibration Isolation
Workstation 740W



Pneumatic Vibration Isolation
System 742



Optical Table Supports
765 / 766



Active Vibration Isolation System
770-5060



Active Vibration Isolation
Workstation 778-5060



Active Vibration Isolation System
776-0200



Laboratory Rack Device
790



Table Connectors
791



Laser Shelves
792



Protective Screens
793



Instrument Shelves
794



Laminar Tabletop Workstation
750



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drawings and order online at
www.eksmaoptics.com

Brackets & Rails



Narrow Aluminium Optical Rail
810-0001



Narrow Aluminium Rail Carriers
810-0002



Aluminium Optical Rails
810-0005



Aluminium Rail Carriers
810-0007



Steel Optical Rails
810-0010



Steel Rail Carriers
810-0020



Sliding Rail Carrier
810-0030



Multiple Mounting Plates
810-0035



Large Rods
810-0040; -0050



Vertical Positioner
810-0060



Large Rod Mounting Clamp
810-0061



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



Periscope on Silent Rods
810-0065



Periscope on Large Rods
810-0067



Large Table Base
810-0070



Angle Brackets
810-0080; -0090



Angle Brackets
810-0100



Angle Brackets
810-0110



Angle Brackets
810-0112



Angle Brackets
810-0115

OPTICAL
TABLESBRACKETS &
RAILSBASE MOUNTS &
ACCESSORIESOPTICAL
MOUNTSOPTICAL
POSITIONERSBASE
POSITIONERSTRANSLATION &
ROTATION STAGESADJUSTMENT
SCREWSMOTORIZED
POSITIONERS



Angle Brackets
810-0116



Angle Brackets
810-0120



Mini Angle Brackets
810-0130



Angle Brackets
810-0140



Angle Brackets
810-0145



Angle Brackets
810-0146



Angle Brackets
810-0150



Angle Brackets
810-0150-01



Angle Brackets
810-0160

Base Mounts & Accessories



Silent Rods
795-0010



Thread Adapters
795-0016



Standard Rods
820-0010; -0020



Collar
820-0030



Rod Translators
820-0040



Translating Post Holder
820-0045



Rod Holders
820-0050



Rod Holder with Base Adapter
820-0051

 Fixed Pedestals 820-0055	 Movable Base 820-0060	 Movable Base 820-0070	 Movable Base 820-0080	OPTICAL TABLES
 Movable Base 820-0090	 Movable Base 820-0100	 Table Bases 820-0110	 Base Plates with eccentric clamp 820-0120	BRACKETS & RAILS
 Table Clamp 820-0125	 Base Plate with Rotary Clamp 820-0130	 Universal Base Plates 820-0135	 Universal Base Plates 820-0136	BASE MOUNTS & ACCESSORIES
 Low-profile Magnetic Base 820-0140	 Compact Magnetic Bases 820-0150	 Riser Blocks 820-0160; -0170	 Rod Clamp 820-0180	OPTICAL MOUNTS
 Rod Clamp 820-0190	 Rod Clamp 820-0200	 Solid Base Height Extenders 820-0210; -0220	 Rod Holders Base Adapter 820-0225	OPTICAL POSITIONERS
				BASE POSITIONERS
				TRANSLATION & ROTATION STAGES
				ADJUSTMENT SCREWS
				MOTORIZED POSITIONERS



Table Clamps
820-0230



Table Clamps
820-0240



Connecting Cones
820-0250; -0254



Screws
820-0260



Hex key
820-0270



Screws
820-0280



Washer
820-0290

Optical Mounts



Self-Centring Lens Mounts
830-0010; -0020



Self-Centering Lens/Optics Mounts
830-0025



Self-Centering Lens/Optics Mounts
830-0027-08



Adjustable Lens Mounts
830-0030



Universal Adjustable Lens/Optics
Mounts 830-0035



Optical Component Mounts
830-0037



Variable Lens Holder
830-0040



Optics Clamp
830-0050



Plate Clamp
830-0055



Filter Holders
830-0060A; -0070A



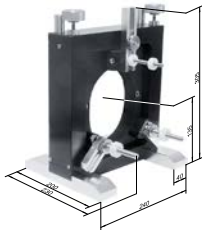
Universal Plate Holder
830-0075



Rectangular Optics Holder
830-0100; -0110

OPTICAL
TABLESBRACKETS &
RAILSBASE MOUNTS &
ACCESSORIES

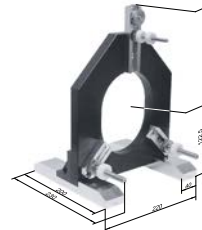
Optical Positioners



Large Adjustable Kinematic
Optical Mount 840-0005



Precise Adjustable Kinematic Mount
for Large Optics 840-0005-05



Large Optical
Mount 840-0006



Self-centring Large Aperture
Optical Mount 840-0007

OPTICAL
MOUNTSOPTICAL
POSITIONERS

Kinematic Mirror and Beamsplitter
Steel Mounts 840-0010; -0020



Kinematic Mirror and Beamsplitter
Steel Mounts 840-0030



Kinematic Mirror, Beamsplitter
Aluminium Mounts 840-0032; -0033



Stable Steel Mirror/Beamsplitter
Mounts 840-0036

BASE
POSITIONERSTRANSLATION &
ROTATION STAGES

Precision and High Stability
Aluminium Optics Mounts
840-0040; -0050



Universal Mirror Mount/Platform
840-0052



Large Aperture Optical Mount
840-0053



Miniature Kinematic Mirror /
Beamsplitter Mount 840-0054

ADJUSTMENT
SCREWSMOTORIZED
POSITIONERS

OPTICAL
COMPONENTS



Kinematic Mirror / Beamsplitter
Mounts **840-0056**



Mounts with hard seats
840-0057



Compact Kinematic Mirror /
Window Mount **840-0058-01**



Mirror / Optics Mount
840-0060

NONLINEAR & LASER
CRYSTALS



Mirror Mounts with Locking Screws
840-0080



Compact Mirror Mount
840-0090



Miniature Tilt / Rotation Mount of
Side Control **840-0093**



Gimbal Mount
840-0096

ND:YAG LASERLINE
COMPONENTS



Round Optics Adapter
840-0100-A1



Miniature Clamp
840-0100-A2



Mirror Adapter
840-0100-A3



Prism and Polarizing Cube Adapters
840-0100-A4



Platform Adapter
840-0100-A5

FEMTOLINE
COMPONENTS



Small Optical Mount
of Side Drive **840-0102-T**



Mirror Mounts of Side Regulation
840-0110-T



Round Optics Adapters
840-0110-A1



Miniature Clamp
840-0110-A2

OPTICAL
SYSTEMS



Mirror Adapter
840-0110-A3



Platform Adapter
840-0110-A5



Spring Clamps
840-0111; -0112



Adapter for Mirror and
Beamsplitter at 45° **840-0115**



Adapter for Mirror and
Beamsplitter at 45° **840-0116**

OPTO-MECHANICAL
COMPONENTS

				OPTICAL TABLES
Adapters for Polarizer at 56° 840-0117	Adapters for Polarizer at 56° 840-0118	Prism / Optics Mount 840-1120-B	Universal Platform Mount 840-2120-B	BRACKETS & RAILS
				BASE MOUNTS & ACCESSORIES
Beamsplitter / Mirror Mounts 840-3120-B	Mirror Optical Mount 840-4120-B	Objective Mount 840-0120-T	Beamsplitters / Optics Mount 840-0130-T	OPTICAL MOUNTS
				OPTICAL POSITIONERS
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				TRANSLATION & ROTATION STAGES
Miniature Flipping Mirror / Beamsplitter Mount 840-0155-06; -09	Prism Holders 840-0160; -0170	Polarizer Holders 840-0180	Polarizer Holders 840-0185	ADJUSTMENT SCREWS
				MOTORIZED POSITIONERS
High Precision Rotation Polarizer, Waveplate Mount 840-0186	Polarizer Holder 840-0190	Beamsplitter Mount of Side Drive 840-0191	Kinematic Double Optical Mount of Side Drive 840-0192	



Kinematic Optical Mount
of Side Drive **840-0193**



Adjustable Polarizer Holder
of Side Drive **840-0195**



Optical Mount of Side Drive with
Adjustable Polarizer Holder **840-0197**



Kinematic Adjustable Polarizer
Holder of Side Drive **840-0199**



Five axes Kinematic Optical Mount
840-0210



Kinematic Vertical Drive Optical
Mount/Vertical Drive Optical Mount
840-0220; -0225



Kinematic Vertical Drive Optical
Mount **840-0230**



Two Axes Translation Polarizer Holder
840-0240

Base Positioners



Multi-Axis Tilt Platform
850-0010



Kinematic Bases
850-0020; -0022



Magnetic Kinematic Base
850-0030



Single Axis Tilt Stage
850-0040



Adjustable Laser / Laser Head Holder
850-0095



Adjustable Height Platform
850-0200



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Translation & Rotation Stages



Compact Translation Stage
860-0010



Translation Stage
860-0051



XYZ Translation System
860-0051XYZ



Vacuum Compatible Translation System
860-0051XYZ



Stable Steel Translation Stage
860-0052



Low Cost Linear Translation Stage
860-0053



Stainless Steel Single to Multi-Axes Stages
860-0054



Non-Magnetic Translation Stage
860-0056



Side Control Linear Stages
860-0058



Narrow (30 mm) Aluminium Translation Stages
860-0060-02; -05



Medium (50 mm) Aluminium Translation Stages
860-0060-06; -08; -10



Vacuum Compatible Aluminium Translation Stages
860-0060V-08; -10



Low Profile Aluminium Translation Stages
860-0070-02; -04



Low Profile Translation Stage with Quick Move Lever
860-0070-06



Vertical Translation Stage
860-0075



Basic Translation Stages
860-0085



Mini Rail System Ball Slide Positioners
860-0090



Ultra Low Profile Steel Translation Stages Single and two-Axes
860-0092



Side Control Linear Steel Stages
860-0092T



Vertical Drive Ultra Low Profile Steel Translation Stages
860-0092D

OPTICAL
TABLESBRACKETS &
RAILSBASE MOUNTS &
ACCESSORIESOPTICAL
MOUNTSOPTICAL
POSITIONERSBASE
POSITIONERSTRANSLATION &
ROTATION STAGESADJUSTMENT
SCREWSMOTORIZED
POSITIONERS

OPTICAL
COMPONENTS



Low Profile two-Axes Aluminium
Translation Stage **860-0094**



Low Profile two-Axes Aluminium
Translation Stage of Side Control
860-0094-02



Aluminium Ball Bearing Stage
860-0096



Aluminium Ball Bearing Vertical
Stages **860-0098**

NONLINEAR & LASER
CRYSTALS



Vertical Stage
860-0099



Micro Translation Stage
860-0100



XZ Micro Translation Stage of
Side Regulation **860-0102**



Linear Flexure Translation
Stage **860-0105**



Dovetail Linear Translation
Stage **860-0106**

ND:YAG LASERLINE
COMPONENTS



Tilt / Rotation Stage
860-0110



Mini Rotation Stage
860-0120



Micro Rotation Stage
860-0130



Precision Rotary Stage
860-0140

FEMTOLINE
COMPONENTS



2 inch Aperture Rotation Stage
860-0150



Rotation Stages
860-0155



Vacuum Compatible Rotation Stage
860-0155V



Rotation Stage of Big Platform
860-0160

OPTICAL
SYSTEMS



Rotation Stage of Big Platform
860-0165



Mini Rotation Stage
860-0170



Small Goniometer
860-0180



Fiber Coupling Stage
860-0210

OPTO-MECHANICAL
COMPONENTS

Adjustment Screws



Precise and Micrometer Screws
870-0010; -0020



Fine Closed Screw
870-0030



Micrometer Screws
870-0040



Thin Micrometers
870-0045



High-Resolution Micrometers
870-0050



Mini Micrometers
870-0055



Compact Fine Screws
870-0060



Adjustment Screws
870-0070; -0071



Ultra-Fine Adjustment Screws
870-0080



Fine hex Adjustment Screws
870-0090; -0095

Motorized Positioners



Motorized Mirror Mounts
940-0050



Motorized Mirror / Beamsplitter Mount
940-0060



Motorized Two Axes Translation Optical Mount
940-0070



Vacuum Compatible Motorized Vertical Drive Optical Mount with DC motor
940-0080



Motorized Flipper Mount
940-0090



Motorized Gimbal Mount
940-0096



Motorized Vertical Translation Stage
940-0200



Motorized Vertical Stage
940-0210

OPTICAL
COMPONENTS



Motorized Z Stage
940-0212



Motorized Vertical Positioning Stage
940-0215



Motorized Precision Vertical
Positioner **940-0218**



Motorized Vertical Lift Stage
940-0220

NONLINEAR & LASER
CRYSTALS



Narrow Motorized Translation Stage
with Stepper Motor **960-0050**



Narrow Motorized Translation Stage
with Vacuum Compatible Stepper
Motor **960-0050V**



Narrow Motorized Translation
Stages with DC Motors
961-0050; 962-0050



Narrow (width 30 mm) Motorized
Translation Stages **960-0060-01; -04**

ND:YAG LASERLINE
COMPONENTS



Medium (width 50 mm) Motorized
Translation Stages **960-0060-06; -12**



Vacuum Compatible Motorized
Stages **960-0060V**



Motorized Translation Stage
960-0065



Motorized Translation Stage
960-0080

FEMTOLINE
COMPONENTS



Motorized Translation Stage
960-0090



Motorized Translation Stage
960-0095



Motorized Translation Stage
with SM System **960-0095SM**



Motorized Translation Stage
with DC motor **961-0095**

OPTICAL
SYSTEMS



Motorized XY Scanning Stage
960-0097



Motorized Delay Line
960-0100



Long-Travel Motorized Linear Stages
960-0110



Long-Travel Motorized Linear Stages
960-0115

OPTO-MECHANICAL
COMPONENTS



Large Motorized Rotation Stages
960-0130



Motorized Rotation Stages
960-0140



Motorized Rotation Stages
960-0150



Motorized Rotation Stages
with SM System **960-0140SM**

OPTICAL
TABLESBRACKETS &
RAILS

Motorized Rotation Stages
with SM System **960-0150SM**



Motorized Rotation Stages
960-0160



Motorized Rotation Stages
960-0170



Vacuum Compatible Motorized
Rotation Stage **960-0170V**

BASE MOUNTS &
ACCESSORIESOPTICAL
MOUNTS

Motorized Goniometers
960-0180



Universal Motorized Rotation Stage
960-0190



Motorized Vertical Translation Stage
960-0199



Large Motorized Rotation Stage
960-0250

OPTICAL
POSITIONERS

Narrow Motorized Translation Stage
with DC Motor **961-0060**



Narrow Motorized Translation Stage
with Vacuum Compatible DC Motor
961-0060V



Motorized Screws
970-0040



Motorized Actuator
970-0050

BASE
POSITIONERSTRANSLATION &
ROTATION STAGESADJUSTMENT
SCREWSMOTORIZED
POSITIONERS

Compact Motorized Actuator
970-0060



Motorized Actuator
970-0065



Ultra-High Resolution Compact
Motorized Actuator (DC Motor)
970-0067



Ultra-High Resolution Compact
Motorized Actuator with Vacuum
Compatible DC motor **970-0067V**

OPTICAL
COMPONENTS



Motorized Fiber Coupling Stage
970-0070



Motorized Translation Stage
970-0080



Motorized Translation Stage
970-0085



Motorized Rotation and Tilt Stage
970-0090

NONLINEAR & LASER
CRYSTALS



Stepper & DC Motor Controller
980-0045-USB



Power Supplies



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SYSTEMS

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COMPONENTS

Optical Systems



Beam Expanders

F-Theta Lenses

Variable Attenuators
for Linearly Polarized Laser Pulses

Gauss-to-Top Hat Beam Shaping lenses



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Tweezers / Forceps for Optical Components	A.4
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Useful Formulas & Constants

Physical Constants

Planck's constant $h = 6.6260755 \times 10^{-34} \text{ J}\cdot\text{s} = 4.5 \times 10^{-15} \text{ eV}\cdot\text{s}$
 $= 6.626 \times 10^{-27} \text{ erg}\cdot\text{s}$
 Dirac's constant $\hbar = h/2\pi = 1.054 \times 10^{-34} \text{ J}\cdot\text{s} = 1.054 \times 10^{-27} \text{ erg}\cdot\text{s}$
 Boltzmann's constant $k_B = 1.380 \times 10^{-16} \text{ erg/K}$
 $= 8.62 \times 10^{-5} \text{ eV/K} = 1.380 \times 10^{-23} \text{ J/K}$
 $kT = 25.9 \text{ meV}$ at room temperature
 $= 0.36 \text{ meV}$ at liquid-helium temperature (4.2 K)
 $= 6.7 \text{ meV}$ at liquid-nitrogen temperature (77 K)
 Velocity of light in vacuum $c = 2.99792458 \times 10^8 \text{ m/s}$
 Electron charge $e = 1.602 \times 10^{-19} \text{ coulombs}$
 Avogadro number $N_A = 6.0221367 \times 10^{23} \text{ particles/mol}$
 Permeability of vacuum $\mu_0 = 4\pi \times 10^{-7} \text{ T}^2\cdot\text{m}^3/\text{J}$
 $= 12.566370614 \times 10^{-7} \text{ T}^2\cdot\text{m}^3/\text{J}$
 Permittivity of vacuum $\epsilon_0 = 1/(\mu_0 c^2) = 8.854187817 \times 10^{-12} \text{ C}^2/\text{J}\cdot\text{m}$
 Electron rest mass $m_e = 9.1093897 \times 10^{-31} \text{ kg}$
 Proton rest mass $m_p = 1.6726231 \times 10^{-27} \text{ kg}$
 Neutron rest mass $m_n = 1.6749286 \times 10^{-27} \text{ kg}$

Wave Vector, Frequency, Wavelength & Wavenumbers

$$k = \frac{2\pi}{\lambda} = \frac{2\pi n}{\lambda_0} = \frac{2\pi n\nu}{c} = \frac{n\omega}{c}$$

$$\lambda = \frac{c}{n\nu} = \frac{\lambda_0}{n} = \frac{2\pi}{k} = \frac{2\pi c}{n\omega}$$

$$\nu = \frac{c}{\lambda_0} = \frac{c}{n\lambda} = \frac{kc}{2\pi n} = \frac{\omega}{2\pi}$$

$$\Delta\lambda = \frac{c\Delta\nu}{\nu^2} = \frac{\lambda^2\Delta\nu}{c}$$

An easy number to remember is a 1-pm linewidth is approximately 125 MHz at 1550 nm.

Wavenumber (cm^{-1}) = $\frac{10^7}{\lambda \text{ (nm)}}$

Electron Volts (eV) = $\frac{1242}{\lambda \text{ (nm)}}$

k = wave vector
 ν = frequency
 $\omega = 2\pi\nu$ = angular frequency
 λ = wavelength
 λ_0 = wavelength in vacuum
 n = refractive index

Wavelength (in vacuum), nm	Frequency, THz	Electron Volts, eV	Wavenumber, cm^{-1}
1561.42	192.00	0.80	6404.43
1550	193.41	0.80	6451.61
1320	227.12	0.94	7575.76
1064	281.76	1.17	9398.50
980	305.91	1.27	10204.08
780	384.35	1.59	12820.51
632.8	473.76	1.96	15802.78
350	856.55	3.55	28571.43

Common Material Properties

Material	Refractive Index, n	ΔFSR^* , MHz	Thermal Expansion Coefficient α , ppm/ $^{\circ}\text{C}$	Thermo-Optic Coefficient β or $\partial n/\partial T$, ppm/ $^{\circ}\text{C}$
Air	1.000	0.0	0.0	1.0
Fused Silica	1.444	13.1	0.55	6.57
Silicon	3.477	198.1	3.24	160
LASFN9	1.813	9.4	7.4	1.3

* Change in FSR due to dispersive effects as measured from 1510 to 1570 nm for a 50-GHz etalon

Etalon Formulas

Two parameters completely specify an etalon: the free spectral range (FSR) and the finesse ($\mathfrak{F}$). The FSR is the spacing (usually given in frequency) between transmission peaks. The finesse is the ratio of the free spectral range to the full width at half maximum (FWHM) of the transmission peak and is directly related to the reflectivity of the surface R .

$$FSR = \frac{c}{2nl} \quad \mathfrak{F} = \frac{FSR}{FWHM} = \frac{\pi\sqrt{R}}{1-R}$$

c is the speed of light, n is the index of refraction of the etalon, and L is the thickness of the etalon.

At high finesse values (where R is very close to 100% or 1),

$$R \approx 1 - \frac{\pi}{\mathfrak{F}}$$

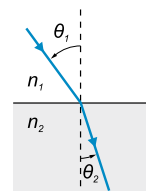
Finesse	Reflectivity
2	24%
4	47%
6	60%
8	68%
10	73%
15	81%
20	85%

International System of Units (SI) Prefixes

Factor	Name	Symbol
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^9	giga	G
10^6	mega	M
10^3	kilo	k
10^2	hecto	h
10^{-2}	centi	c
10^{-3}	mili	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

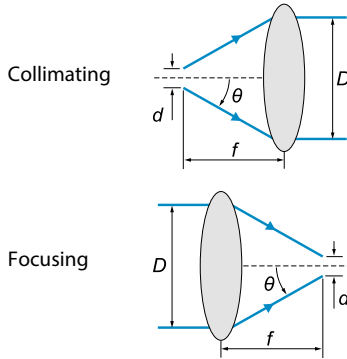
Snell's Law

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$



Numerical Aperture

$$f/\# = \frac{f}{D} \approx \frac{1}{2NA} \quad NA = n \sin \theta$$



Reflection Air / Material

$$R = \left(\frac{n-1}{n+1} \right)^2 \text{ at AOI}=0^\circ$$

Where n – refractive index,
AOI – Angle of Incidence.

Phase Matching Types of Nonlinear Crystals

Negative crystals ($n_o > n_e$)

Type 1 $k_{o1} + k_{o2} = k_{e3}(\theta)$
or “ooe interaction”

Type 2 $k_{e1}(\theta) + k_{o2} = k_{e3}(\theta)$
or “eoe interaction”

Type 2 $k_{o1} + k_{e2}(\theta) = k_{e3}(\theta)$
or “oeo interaction”

Positive crystals ($n_e > n_o$)

Type 1 $k_{e1}(\theta) + k_{e2}(\theta) = k_{o3}$
or “eeo interaction”

Type 2 $k_{o1} + k_{e2}(\theta) = k_{o3}$
or “oeo interaction”

Type 2 $k_{e1}(\theta) + k_{o2} = k_{o3}$
or “eoo interaction”

Whereas k -wave propagation vector ($k=2\pi n/\lambda$); θ – phase matching angle in the crystal; o – ordinary polarization, e – extraordinary polarization; 1, 2, 3 indices – corresponds to wave vectors with longest (1), mid (2) and shortest (3) wavelengths.

Brewster's Angle

The angle where only s-polarized light is reflected

$$\theta_{\text{Brewster}} = \arctan \left(\frac{n_{\text{transmitted medium}}}{n_{\text{incident medium}}} \right)$$

Gaussian Beam

A Gaussian beam spreads as follows,

$$\omega^2(x) = \omega_0^2 \left[1 + \left(\frac{\lambda x}{\pi \omega_0^2} \right)^2 \right]$$

where $\omega(x)$ is the $1/e^2$ radius, λ is the wavelength, and x is the distance from the beam waist ω_0 where $x=0$.

A Rule of Thumb for Choosing a Lens

$$f = \frac{dD\pi}{4\lambda}$$

where f is the lens focal length, d is the beam diameter at the focus, D is the $1/e^2$ diameter of the collimated beam.

Nonlinear Crystal Thickness Limited by Group Velocity Mismatch (GVM)

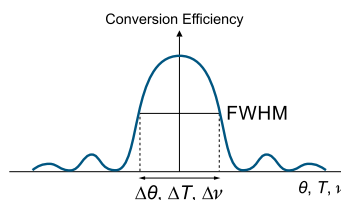
$$L = \frac{t}{GVM} \quad GVM = \frac{1}{u_1} - \frac{1}{u_2}$$

$$u = \frac{c}{n(\lambda)} \left[1 + \frac{\lambda}{n(\lambda)} \frac{\partial n(\lambda)}{\partial \lambda} \right]$$

Whereas t – pulse duration,
 c – speed of the light, n – refractive index, λ – wavelength.

Nonlinear Crystal acceptances

Nonlinear Crystal acceptances – Angular $\Delta\theta$, Temperature ΔT , Spectral $\Delta\nu$ – corresponding bandwidths at Full Width of Half Maximum (FWHM) of conversion efficiency.



Total Internal Reflection Angle

$$\theta_{\text{TIR}} > \arcsin \left(\frac{n_{\text{transmitted medium}}}{n_{\text{incident medium}}} \right)$$

where $n_{\text{transmitted medium}} < n_{\text{incident medium}}$ is required for total internal reflection.

Scaling Law for Laser Radiation Damage

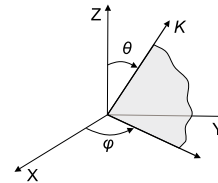
$$E = E_t \sqrt{\frac{t}{t_1}} \quad \text{where } E \text{ [J/cm}^2\text{] is the damage threshold, } t \text{ is the pulse duration, } E_t \text{ and } t_1 \text{ are the reference damage threshold and pulse duration.}$$

Non Critical Phase Matching

NCPM – when crystal phase matching angle equals 90° ($\theta = 90^\circ$). NCPM is achieved at special temperatures and/or wavelengths.

Uniaxial Crystals Refractivity

Polar coordinate system for description of refractive properties of uniaxial crystal.



Whereas K – light propagation vector at phase matching conditions, Z – optical axis of crystal, θ – phase matching angle (or cut angle), ϕ – azimuthal angle.

Birefringency angle or Walk-off

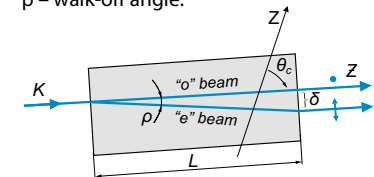
$$\rho(\theta) = \pm \arctan \left[\left(\frac{n_o}{n_e} \right)^2 \tan(\theta) \right] \mp \theta$$

Upper signs refer to negative crystal ($n_o > n_e$) and the lower signs refer to positive one ($n_e > n_o$).

Beam displacement because of walk-off:

$$\Delta = L \tan(\rho)$$

Whereas L – crystal length,
 ρ – walk-off angle.



Optical Components Cleaning Instructions



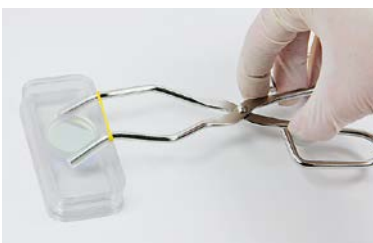
Inspect and make sure that you need to clean your optical component. If it's not necessary, avoid extra cleaning. The polished face of the crystals is the key element that ensures preservation and longer usability of the component. If you need to clean the optical component, please follow these instructions:

- Always wear powder-free latex gloves or finger cots and handle component by the edges. Do not touch the surface of optical component with your fingertips. Avoid handling optics with metal instruments. Use delicate tweezers with soft tips for a small size components.
- Any larger dust and dirt particles can be removed by using very soft brush or compressed air.
Attention: if you use compressed air, keep the distance (at least 10 cm). In the less distance you can damage the polished face with temperature stress.
- If polished face looks fine do not clean with something else. If it's still dirty please use solvents.
Never clean "dry": Cleaning dry optics, no matter what the wiper, is virtually guaranteed to cause problems. Use only extra pure water free class solvents, such as ethyl acetate ($C_4H_8O_2$), butyl acetate ($C_6H_{10}O_2$), or similar. Always use lint-free lens tissues for optics cleaning.
- **For the optical component cleaning** apply a small drop of the cleaning solution on the top surface. Leave enough time for it to dissolve and float away any contaminating materials. But before the cleaner dries, gently wipe the surface with the highest quality lens cleaning tissue.
- **For crystal and small (up to 5 mm² area) optical component cleaning** use lint-free lens tissue or cotton swab. Do not use cotton swabs for a larger component as it leaves stripes. Moisten a tissue with solvent and carefully cross the surface of crystal. Make sure that the wiper size is the same or a bit larger than the polished face of component. The tissue is only for onetime use! Repeat this action till the component looks fine.

If the cleaning does not help to remove contamination the optical component must be repolished.



TWEEZERS / FORCEPS FOR OPTICAL COMPONENTS 260-1050



These stainless steel tweezers/forceps are convenient instrument for handling of optical components with diameter from 10 to 50.8 mm. Tweezers/forceps have silicon tips that reduce the risk of damage of optics.

Catalogue number	Price, EUR
260-1050	9

Crystals Handling Safety Guide



- **Do not open** container until contents are at the room temperature to prevent moisture condensation. Open package carefully in dust free and dry (*relative humidity less than 60%*) atmosphere.



- Please **use gloves** to handle crystals. Hold the crystal at the non-polished faces only. Holding the crystal near the breath will destroy the polishing.



- **Dust** from the polished surface can be **removed by soft paint brush**. Experienced users can try to clean faces with particles-free cotton wool tipped swabs soaked in water free ethyl-acetate.



- The crystals are **temperature sensitive**. Drastic chilling or warming (at the rate $> 5^{\circ}\text{degC/min}$) will cause shattering by thermal stress.



- The crystals should be **stored in desiccator** or in a container with minimum gas volume.



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