

2024

PRODUCT CATALOG



OPTOGAMA

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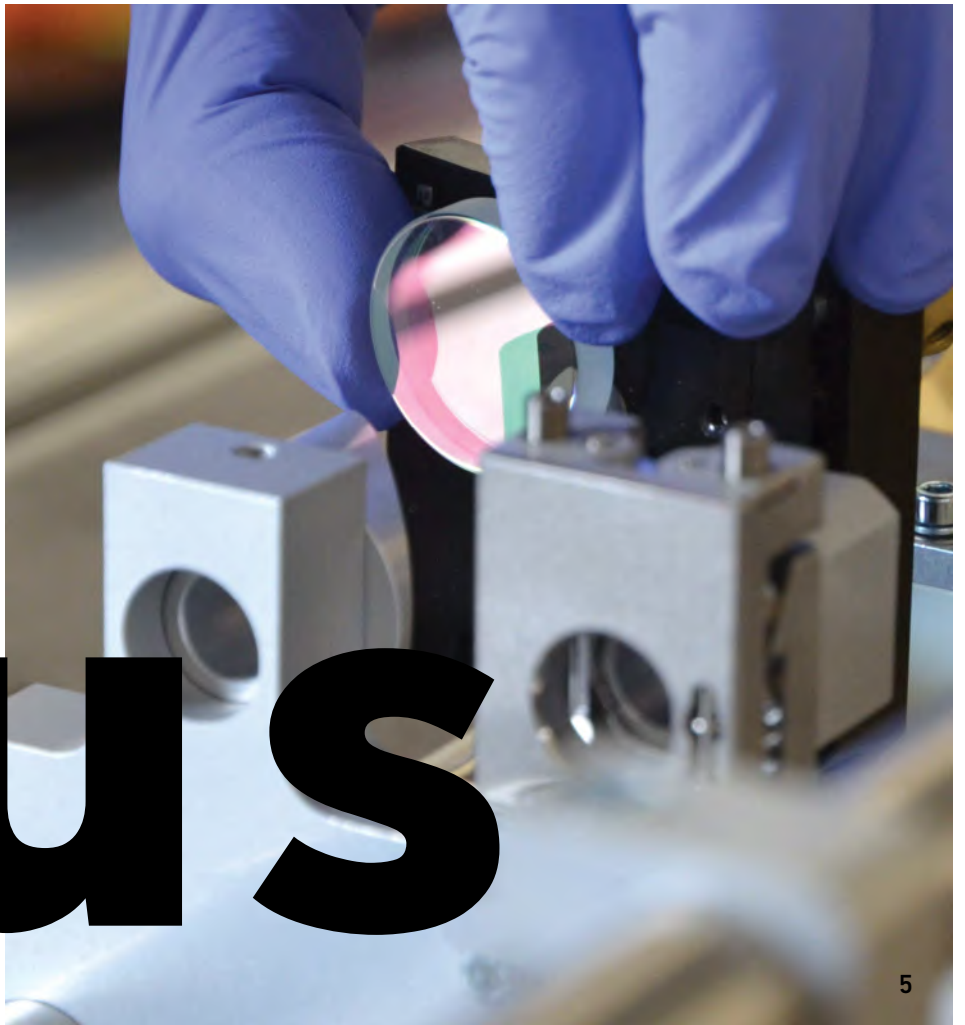


Production building in Vilnius, Lithuania



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New ISO5/ISO6/ISO7 class metrology, assembling and R&D labs



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ABOUT

Main capabilities and specialties

- Production of "eye-safe" 1,54 μm , Nd:YAG passively q-switched DPSS lasers
- Production of compact laser beam delivery systems, laser beam expanders, reducers, divergence compensators and laser power attenuators
- Production of standard and custom laser optical components, laser, and nonlinear crystals
- Design and development of custom laser gain, optical modules, and beam delivery devices
- Development and production of different laser crystal hosts and ion dopant combinations
- Conventional and state of the art laser optics
- Refurbishment of optical elements, crystals
- Optical and optomechanical design of laser gain modules and optical devices
- Clean room environment, optical design, mechanical design, CNC machining
- IBS and E-beam coating services

FIRST R&D PROJECTS

Compact "eye-safe" 1,54 μm wavelength nanosecond lasers "KAUKAS" series.
ASGARD - a source for gas analysis and real time detection.

NEW COMPANY DIVISION

Opening of "4Lasers" - new company division for Laser Components supplying.

2015

COMPANY ESTABLISHMENT

Young and ambitious team was created in order to design, develop and commercialize custom and unique laser products.

2016

2017

METROLOGY AND QUALITY ASSURANCE LAB

Newly set up laboratory improved quality management system that allows us to give relevant, reliable and timely test results.

2018

Optogama

- Over 20 years of experience in the laser and photonics industry
- >70% of staff with a technical background in Laser Physics
- Strength in custom design and production of optical components, beam delivery devices
- Highly efficient communication and short lead time even for custom production
- Assurance of standardized production and quality according to ISO9001
- Guaranteed superior price-performance ratio



FAST COMPANY GROWTH

Financial Times announced Optogama as one of Europe's fastest-growing companies with an absolute growth rate - 250,2%.

NEW PREMISES

Wide space for company team expansion, new dedicated production facilities, ISO5/ISO6/ISO7 class metrology, assembling and R&D labs.

2019

NEW LASERS

Compact "eye-safe" 1,54 μm wavelength nanosecond lasers "KAUKAS" series and Nd:YAG passively q-switched DPSS laser WAVEGUARD were introduced to the market.

2020

2021

IMPLEMENTED ISO 9001 STANDARD

Bureau Veritas certified the Management System of the Optogama in accordance with the ISO 9001:2015 requirements.

2022

2023

NEW IBS AND E-BEAM OPTICAL COATING FACILITIES

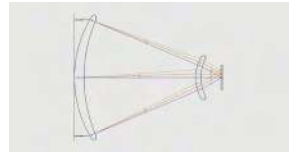
Expanded optics production facilities.



Optogama are looking forward to cooperating with you, assisting in implementing your projects from ideas until full accomplishment. We ready to help with first stages of your projects like prototyping or optical design preparations, to the final stages like cutting finished coated optics or checking final product quality in metrology.

Servi

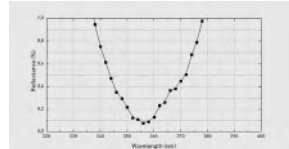
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Optical design



Optics production



Coating services



Optomechanical engineering



Mechanical workshop



Metrology and quality assurance

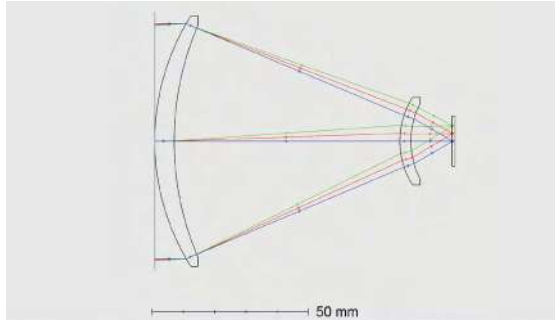


Laser development



Crystal materials development and refurbishment

Optical design



From simple lenses to complex assemblies

The company offers low- and high-power, diffraction-limited optical solutions, which are customized to meet customers specific needs. While developing systems we also consider integrating customers' mechanical and software interfaces.

Available services, based on your requirements:

- Optical design and production of optical elements
- Lens, objectives, beam expanders and collimation optical design
- Beam delivery and light pass modules design
- Laser gain modules and resonators optical design
- Verification and optimization services for your optical design
- Optical material, gain media, optical coatings modeling, design and selection

Features:

- Perception of your application
- Integrated optomechanical system and sequential refractive design
- Gaussian beam propagation simulation according to given beam parameters
- Design and manufacturing technologies according to specified requirements
- Optics and coatings optimization for high damage threshold and high transmittance

Optics production

From raw materials to precise optical components

Optogama manufactures variety of precision optical components, crystals and optical assemblies. Our dedicated and skilled team will ensure that you receive the optimal solution for your application.

Starting from raw materials of various glasses or laser crystals we offer:

- Precision cutting and grinding
- Rounding and centration
- Double side and single side polishing
- Optical contacting and bonding
- Optical coatings
- Coated components cutting while protecting surface



FEATURES AND CAPABILITIES

Diameter and size	1 - 180mm
Cutting tolerance	±0,02mm
Diameter or size tolerance	Up to +0/-0,02mm
Thickness tolerance	Up to ±0,02mm
Surface flatness (P-V)	Up to λ/10
Irregularity (P-V)	Up to 0,1λ
Centering (Beam Deviation)	3 arcmin
Surface Quality	10-5 to 80-50 S-D

Coating services

Ensuring top quality of coatings, offering compliance testing

The company offers design and manufacturing of customized optical components for laser and vision applications with an optimum of coating performance and cost efficiency.

Available coating services based on these technologies:

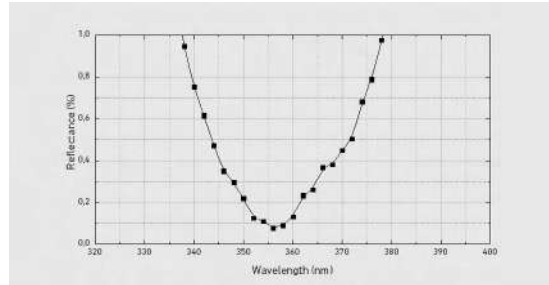
- Ion beam sputtering (IBS)
- E-beam evaporation
- Ion assisted e-beam evaporation (E-beam IAD)
- Magnetron sputtering (MS)
- Atomic layer deposition (ALD)

The variety of coating technologies enables a high-volume fabrication for series products as well as a flexible prototype manufacturing for R&D of:

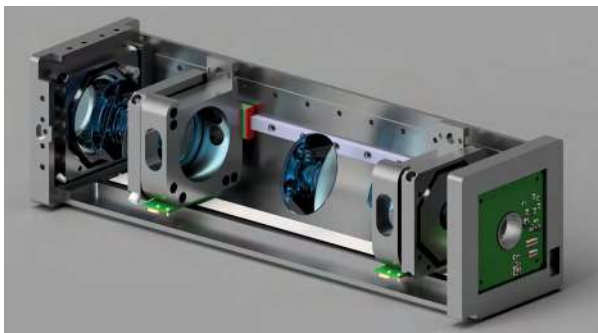
- Anti-Reflection Coatings
- High Power Reflective Coatings
- Ultrafast Coatings
- Infrared Coatings
- Metallic Coatings
- Beamsplitters
- Dichroic Filters
- ITO Coatings

Optogama offer a wide variety of compliance testing to ensure the highest quality of precision optical thin film coating.

Testing capabilities include complete spectral measurement from 190nm to 12000nm absorption and scattering tests, wavefront error, GDD, humidity & durability testing in multiple temperature cycles.



Optomechanical engineering



Top expertise in custom precision optomechanical engineering

Our highly skilled and experienced mechanical engineers provide complete mechanical and optomechanical design services whether you need a new product, or an update and improve existing design.

We're specializing in custom precision mechanical and optomechanical engineering in the photonics industry. By combining our competences in optical and mechanical design and integrating high-quality custom components, our team delivers custom design solutions and engineering services.

Main capabilities:

- Custom laser beam delivery and light path system engineering
- Optical systems engineering
- Optomechanical engineering and prototyping
- Designing with Solidworks and Zemax
- Optical, mechanical and electronics integration

Features:

- Development of concept
- Detailed analysis, prototyping and testing
- Using best practices for CAD and CAM

Mechanical workshop

Design and production of precision optomechanical parts

We offer experience in producing of precision optomechanical parts and components for laser and optical systems, biotechnology, medicine and other industries. Starting from design using "Solidworks" and using "CAMWorks" for CAM programming, we design and produce our own fixtures for part manufacturing.

Manufacturing capabilities:

CNC turning: DMG MORI CLX 450 High-end universal turning machine with direct measuring system.

- Max. workpiece diameter — 400 mm, max. workpiece length — 800 mm
- The machine has a Y axis, active tools and two spindles
- Efficient manufacturing of parts, especially series production, due to a bar feeder

CNC Milling: HAAS VF2-SS and DMG DMU 50:

- Max dimensions on X axis — 762 mm, on Y axis — 450 mm; on Z axis — 500 mm; Workpiece dimensions depend on the finished part's shape, material, and elements which it contains
- Rotations on C axis +/-360°, on B axis — +110°/-5°
- 5 axis and 3+2 milling provides the ability to efficiently process parts of different and unique configurations

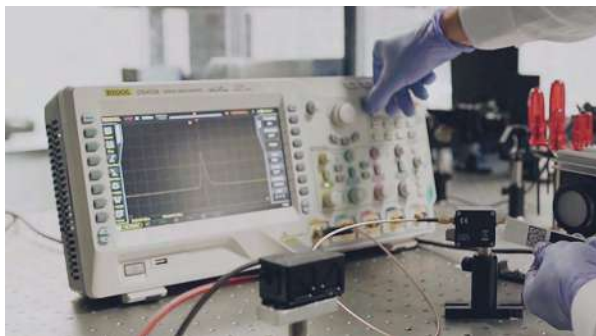


In addition to metal processing we offer Anodizing, Sand blasting, Glass blasting, Tumbling, Engraving, vacuum cleaning and other services

Features:

- From single piece to serial production
- Prompt delivery from 1 week
- Quality control services (CMM HEXAGON Global Lite)
- Consultations and product design optimization

Metrology and quality assurance



Standard and non-standard measurements

The state-of-the-art devices and tools are used to test optical elements, which are integrated into lasers and laser-related systems.

Standard metrology services:

- Wavefront distortion in transmittance/reflectance for parallel and spherical optics (Verifire, Zygo)
- Transmittance and reflectance of optical elements in 200-1700 nm wavelength range (Photon RT, EssentOptics)
- Optical microscopy with polarized light option (Olympus)
- Beam quality (BeamSquared, Ophir)
- Wavelength stability for lasers with 3 pm resolution (WS6, HighFinesse)
- Environmental temperature & humidity tests to test laser performance, coating durability, glue aging, etc. (Binder, Espec)
- Shock and vibration tests

Non-standard test measurements

In case you did not find test measurement that suits your needs, please contact us for non-standard services.

Laser development



Experts in custom designed laser solutions

Our team has an expertise to develop, design, test and produce custom designed laser solutions to meet your unique requirements and stringent OEM applications. It is also available to modify or upgrade standard commercial and scientific lasers.

Our knowledge is based on diode laser-pumped solid-state laser design and assembling, based on passive Q-switching. Experience working with Er,Yb:glass, Pr:YLF, Nd:YAG, Er:YAG, Nd:YVO, Ti:Sapphire and other laser materials allows us to design and test your laser prototypes within short time.

Available solutions:

- From simple modifications to the design of specific and innovative prototype
- Customer visits to assess the requested project and consultations with teams from R&D, including mechanical and optical design groups
- Customization and special engineering services

Features:

- From optical design to prototype validation
- Investigations of various laser gain media and passive q-switching crystal based models
- Side and end LD pumping
- Prototyping and environmental testing

Laser crystals material development and refurbishment

Crystals growth, laser gain media development, crystals refurbishment

We are experts in crystal growth also capable of design and development of custom laser gain and optical modules, state-of-the-art monolithic crystal assemblies and damaged crystals refurbishment service. Our expertise comes from cooperation with scientific and industrial partners through numerous R&D contracts. For damaged crystals we provide cost-effective crystal refurbishment service, including repolishing, recoating, and characterization.

Capabilities:

- Ultrafast laser gain media (Yb:KGW, Yb:KYW, Ti:Sapphire, CaF₂, Pr:YLF, Tm:YLF, Ho:YLF, Er:YLF)
- Passive Q-switch elements (crystalline or ceramic Co:Spinel, Cr:YAG, V:YAG)
- Photorefractive crystals (BSO and BGO, SBN)

Available crystal growth techniques:

- Stepanov
- Modified Flux growth
- Kyropoulos
- Czochralski

Features:

- Custom gain and doping levels
- Material characterization and processing
- Production of final elements



REPOLISHING OF LASER, NONLINEAR AND PHOTOREFRACTIVE CRYSTALS

Diameter and size	1 - 180mm
Surface quality	Up to 10-5 S-D
Surface flatness (P-V)	Up to $\lambda/10$ @ 632.8 nm (for 6x6 mm and smaller crystals)
Coatings	Upon request

Features:

- Fast delivery from 1 week
- Repolishing & resizing
- Recoating
- Metrology and quality assurance
- Final coated and polished element cutting with secured surfaced



Optogama team designs and manufactures a variety of "eye-safe" 1,54 μm diode pumped passively q-switched erbium glass laser transmitters as well as 1064 nm or 532nm wavelength Nd:YAG passively q-switched lasers. Optogama developed CW laser model at 1,5 μm lasing wavelength with an erbium ion doped active laser medium.

Laser

rs



Nd:YAG passively q-switched DPSS lasers "Waveguard"



"Eye-safe" 1,54 μm ns lasers "KAUKAS"



"Eye-safe" 1,5 μm lasers "KAUKAS CW"



1,54 μm ns lasers "Ranger"



Nd:YAG passively q-switched DPSS lasers "Waveguard"

Main features

- Robust and compact design
- Internal and external TTL triggering
- Laser controller with USB or RS232 interface
- OEM version available

Application examples

- Material processing & micromachining
- LIBS
- Marking
- LIDAR & Laser Ranging
- Biophotonics

The typical configuration of these lasers is based on a Nd:YAG crystal placed in a cavity of a few millimeters in length, leading to a very compact laser design with a surprising performance, such as sub-nanosecond pulse widths and a peak power of several tens of kilowatts. State-of-the-art robust laser design allows it to be easily integrated into various laser applications and setups. Additional harmonics modules for 532 nm, 355 nm, or 266 nm wavelengths are available on request for all models. "Waveguard" series lasers offer wavelength stabilization possibility up to 3 pm and laser modules with a photodiode to control pulse repetition rate are available on request for all models.

Standard specifications

LASERS "WAVEGUARD" STANDARD SPECIFICATIONS	
Wavelength	1064 nm*
Wavelength tolerance	±1 nm
Repetition rate	1 Hz - 10 kHz
Pulse energy	Up to 400 µJ
Energy stability, STD	<2 %
Polarization contrast	>100:1
Beam diameter at exit window	<1 mm
Beam divergence	<5 mRad
Beam quality	M ² < 1,5
Beam profile	TEM ₀₀

*Custom wavelength available

Standard products

LASER MODEL	WAVELENGTH	REPETITION RATE	PULSE ENERGY	AVERAGE OUTPUT POWER	PULSE DURATION	SKU	PRICE
WAVEGUARD-A	1064 nm	10 kHz	10 µJ	100 mW	<1 ns	8881	Request
WAVEGUARD-D	1064 nm	1 kHz	120 µJ	120 mW	<1 ns	2248	6250 €
WAVEGUARD-E	1064 nm	100 Hz	400 µJ	40 mW	<1 ns	8795	6500 €
WAVEGUARD-2D	532 nm	1 kHz	50 µJ	50 mW	<1 ns	8820	6950 €
WAVEGUARD-2E	532 nm	100 Hz	150 µJ	15 mW	<1 ns	8964	7250 €
WAVEGUARD-D-ARR	1064 nm	1 Hz - 1 kHz	120 µJ	120 mW	<1 ns	19214	6700 €
WAVEGUARD-E-ARR	1064 nm	1 Hz - 100 Hz	400 µJ	40 mW	<1 ns	19215	6950 €
WAVEGUARD-2D-ARR	532 nm	1 Hz - 1 kHz	50 µJ	50 mW	<1 ns	19532	7450 €
WAVEGUARD-2E-ARR	532 nm	1 Hz - 100 Hz	150 µJ	15 mW	<1 ns	19533	7700 €

Utility requirements

LASERS "WAVEGUARD" UTILITY REQUIREMENTS	
Laser module dimensions	170 x 103 x 64 mm (L x W x H)
Laser driver dimensions	164 x 105 x 44 mm (L x W x H)
Pump current	8-10 A
Electric	100-240 V AC, 50/60 Hz
Working temperature	20-28 °C
Cooling	TEC element + active air cooling



“Eye-safe” 1,54 μm ns lasers “KAUKAS 2”

Main features

- Compact robust design
- Wide operating temperature range
- 2 mJ energy model
- OEM version available

Application examples

- LIDAR & Laser Ranging
- LIBS
- Metrology and instrumentation

„Eye-safe” 1,54 μm wavelength nanosecond lasers series „KAUKAS 2” possess a unique compact design and are available in OEM models for dedicated applications such as LIDAR or laser ranging. “Eye-safe” 1,54 μm wavelength lasers model „KAUKAS 2” delivers up to 2 mJ energy per pulse with a repetition rate of up to 2 Hz.

Standard specifications

LASERS “KAUKAS 2” STANDARD SPECIFICATIONS	
Wavelength	1534 nm
Wavelength tolerance	± 1 nm
Repetition rate	SS - 2 Hz
Pulse energy	>2 mJ
Energy stability, STD	<3 %
Pulse duration	<11 ns
Beam diameter at exit window	<1 mm
Beam quality	$M^2 < 2$
Beam profile	TEM ₀₀

Standard products

LASER MODEL	WAVELENGTH	REPETITION RATE	PULSE ENERGY	PULSE DURATION	OPERATING TEMPERATURE	WEIGHT	POWER SUPPLY AND DRIVER	SKU	PRICE
KAUKAS 2	1534 nm	SS-2Hz	>2 mJ	<11 ns	-20°C to +60°C	0,1 kg	Excluded	30828	3600 €
					+10°C to +40°C	0,1 kg	Excluded	30920	3400 €
					+10°C to +40°C	0,1 kg	Included	30943	4500 €

Utility requirements

LASERS “KAUKAS 2” UTILITY REQUIREMENTS	
Laser module dimensions	61 x 33 x 29,5 mm (L x W x H)
Laser driver dimensions	128 x 83 x 48 mm (L x W x H)
Pump current	<100 A
Pump duration	<4 ms
Electric	100-240 V AC, 20 A, 50/60 Hz
Working temperature	-20 °C - +60 °C
Cooling	Passive air cooling



"Eye-safe" 1,54 μm ns lasers "KAUKAS 3"

Main features

- Compact robust design
- High energy per pulse (>3 mJ)
- Wide operating temperature range
- OEM version available

Application examples

- LIDAR & Laser Ranging
- LIBS
- Metrology and instrumentation
- Research

"Eye-safe" 1,54 μm wavelength nanosecond lasers "KAUKAS 3" possess a unique compact design and are available in OEM models for dedicated applications such as LIDAR or laser ranging. This specific "Eye-safe" 1,54 μm wavelength lasers model "KAUKAS 3" delivers up to 3 mJ energy per pulse with a repetition rate of up to 1 Hz.

Standard specifications

LASERS "KAUKAS 3" STANDARD SPECIFICATIONS	
Wavelength	1534 nm
Wavelength tolerance	± 1 nm
Repetition rate	55-1Hz
Pulse energy	>3 mJ
Energy stability, STD	<3 %
Pulse duration	<8 ns
Beam diameter at exit window	<1 mm
Beam quality	$M^2 < 2$
Beam profile	TEM ₀₀

Standard products

LASER MODEL	WAVELENGTH	REPETITION RATE	PULSE ENERGY	PULSE DURATION	OPERATING TEMPERATURE	WEIGHT	POWER SUPPLY AND DRIVER	SKU	PRICE
KAUKAS 3	1534 nm	55-1 Hz	>3 mJ	<8 ns	-20°C to +60°C	0,1 kg	Excluded	30829	4000 €
					+10°C to +40°C	0,1 kg	Excluded	30944	3800 €
					+10°C to +40°C	0,1 kg	Included	30945	4900 €

Utility requirements

LASERS "KAUKAS 3" UTILITY REQUIREMENTS	
Laser module dimensions	61 x 33 x 29.5 mm (L x W x H)
Laser driver dimensions	128 x 83 x 48 mm (L x W x H)
Pump current	<100 A
Pump duration	<4 ms
Electric	100-240 V AC, 20 A, 50/60 Hz
Working temperature	- 20 - +60 °C
Cooling	Passive air cooling



"Eye-safe" 1,54 μm ns lasers "KAUKAS HR"

Main features

- Compact robust design
- Energy per pulse $>30 \mu\text{J}$ @ 1 kHz
- Pulse repetition rate control
- OEM version available

Application examples

- LIDAR & Laser Ranging
- LIBS
- Metrology and instrumentation
- Automotive

"Eye-safe" 1,54 μm wavelength nanosecond high repetition rate (up to 1 kHz) DPSS lasers „KAUKAS HR“ possess a unique compact design and are available in OEM models for dedicated applications. „KAUKAS HR“ laser models have adjustable repetition rate feature. They deliver more than 30 μJ energy per pulse with a repetition rate of up to 1 kHz available on request.

Standard specifications

LASERS "KAUKAS HR" STANDARD SPECIFICATIONS	
Wavelength	1534 nm
Wavelength tolerance	$\pm 1 \text{ nm}$
Repetition rate	100 Hz - 1 kHz
Pulse energy	$>30 \mu\text{J}$
Energy stability, STD	$<2 \%$
Pulse duration	$<6 \text{ ns}$
Beam diameter at exit window	$<1 \text{ mm}$
Beam quality	$M^2 < 2$
Beam profile	TEM ₀₀

Standard products

LASER MODEL	WAVELENGTH	REPETITION RATE	PULSE ENERGY	PULSE DURATION	OPERATING TEMPERATURE	WEIGHT	SKU	PRICE
KAUKAS HR	1534 nm	100 Hz	$>45 \mu\text{J}$	$<7 \text{ ns}$	15 - 35 °C	0,2 kg	9746	4000 €
		1 kHz	$>30 \mu\text{J}$	$<7 \text{ ns}$	15 - 35 °C	0,2 kg	15575	4150 €

Utility requirements

LASERS "KAUKAS HR" UTILITY REQUIREMENTS	
Laser module dimensions	111 x 34 x 25,5 mm (L x W x H)
Laser driver dimensions	164 x 105 x 44 mm (L x W x H)
Pump current	$<7 \text{ A}$
Electric	100-240 V AC, 50/60 Hz
Working temperature	15 - 35 °C
Cooling	Passive air cooling



“Eye-safe” 1,54 μm ns lasers “KAUKAS 0.3”

Main features

- Robust design
- Integration into portable devices
- OEM version available

Application examples

- LIDAR & Laser Ranging
- LIBS
- Metrology and instrumentation

„Eye-safe” 1,54 μm wavelength nanosecond lasers “KAUKAS 0.3” possess a unique compact design and are available in OEM models for dedicated applications. This specific “eye-safe” 1,54 μm wavelength lasers model “KAUKAS 0.3” delivers up to 0.3 mJ energy per pulse with a repetition rate of up to 10 Hz. The unique laser optical design requires only up to 10 A pump current allowing this laser to be integrated into portable energy – efficient devices.

Standard specifications

LASERS “KAUKAS 0.3” STANDARD SPECIFICATIONS	
Wavelength	1534 nm
Wavelength tolerance	± 1 nm
Repetition rate	1-10 Hz
Pulse energy	0.3 mJ
Energy stability, STD	<2 %
Pulse duration	<5 ns
Beam diameter at exit window	<1 mm
Beam quality	$M^2 < 2$
Beam profile	TEM ₀₀

Standard products

LASER MODEL	WAVELENGTH	REPETITION RATE	PULSE ENERGY	PULSE DURATION	OPERATING TEMPERATURE	WEIGHT	SKU	PRICE
KAUKAS 0.3	1534 nm	1-10 Hz	0.3 mJ	<5 ns	-20 - +40 °C	0,2 kg	32273	3200 €

Utility requirements

LASERS “KAUKAS 0.3” UTILITY REQUIREMENTS	
Laser module dimensions	85 x 26 x 20 mm (L x W x H)
Laser driver dimensions	128 x 83 x 48 mm (L x W x H)
Pump current	<10 A
Pump duration	<4 ms
Electric	100-240 V AC, 3,6 A, 50/60 Hz
Working temperature	-20 - +40 °C
Cooling	Passive air cooling



1,54 μm ns lasers "Ranger"

Main features

- Compact design
- Integration into portable devices
- OEM version available

Application examples

- LIDAR & Laser Ranging
- LIBS
- Metrology and instrumentation
- Automotive

The "RANGER" nanosecond lasers at a wavelength of 1.54 μm feature a distinctive compact design and are offered in OEM configurations tailored for specific uses like LIDAR or laser ranging applications.

The "RANGER" laser operating at a 1.54 μm wavelength can provide a pulse energy of up to 1.5 mJ, and it achieves a repetition rate ranging from 5 to 10 Hz.

Standard specifications

LASERS "RANGER" STANDARD SPECIFICATIONS	
Wavelength	1534 nm
Wavelength tolerance	± 1 nm
Repetition rate	5-10 Hz
Pulse energy	>1,5 mJ@5Hz >1.3 mJ@10Hz
Energy stability, STD	<3 %
Pulse duration	<6 ns
Beam diameter at exit window	<1 mm
Beam quality	$M^2 < 2$
Beam profile	TEM ₀₀

Standard products

LASER MODEL	WAVELENGTH	ENERGY PER PULSE	REPETITION RATE	PULSE DURATION	BEAM DIAMETER (ON OC)	OPERATING TEMPERATURE	POWER SUPPLY AND DRIVER	SKU	PRICE
1,54 μm ns lasers "Ranger"	1534 nm	>1,5 mJ	5-10 Hz	<6 ns	<1 mm	-20°C to +60°C	Excluded	32008	4200 €
						+10°C to +40°C	Excluded	32009	4000 €
						+10°C to +40°C	Included	32010	5100 €

Utility requirements

LASERS "RANGER" UTILITY REQUIREMENTS	
Laser module dimensions	62 x 33 x 24 mm (L x W x H)
Laser driver dimensions	164 x 78 x 46 mm (L x W x H)
Pump current	<100 A
Pump duration	<2,5 ms
Operating environment temperature	-40 °C ... +60 °C
Cooling	Passive air cooling



"Eye-safe" 1,5 μm lasers "KAUKAS CW"

Main features

- Up to 400 mW
- Compact DPSS design
- Various 1,5 μm wavelength models
- High beam quality

Application examples

- Optical instrumentation
- Metrology and spectroscopy
- Life sciences

"KAUKAS CW" series of diode-pumped, solid-state laser models that deliver up to 400 mW of continuous-wave power at several 1,5 μm wavelengths. These erbium-doped gain media based economical, active air-cooled lasers provide a unique combination of high performance, exceptional lifetime, and outstanding reliability. "KAUKAS CW" "eye-safe" lasers offer a diffraction-limited, TEM₀₀ output beam, excellent power stability, and narrowband spectrum.

Standard specifications

"KAUKAS CW" LASERS STANDARD SPECIFICATIONS	
Wavelength	1,5 μm
Wavelength tolerance	± 1 nm
Laser operating mode	CW
Average output power	up to 400 mW
Power stability	<3 %
Polarization contrast	>100:1
Beam diameter at exit window	<1 mm
Beam divergence	<5 mRad
Beam quality	M ² < 1,5
Beam profile	TEM ₀₀

Standard products

LASER MODEL	WAVELENGTH	AVERAGE OUTPUT POWER	SKU	PRICE
KAUKAS CW-K	1522 nm	300 mW	9749	5800 €
KAUKAS CW-P	1531 nm	300 mW	9750	5800 €
KAUKAS CW-N	1542 nm	300 mW	16114	5800 €
KAUKAS CW-G	1550 nm	400 mW	9751	5800 €
KAUKAS CW-Y	1555 nm	300 mW	16115	5800 €
KAUKAS CW-S	1602 nm	150 mW	9752	5800 €

Utility requirements

"KAUKAS CW" LASERS UTILITY REQUIREMENTS	
Laser module dimensions	175 x 78 x 86 mm (L x W x H)
Laser driver dimensions	164 x 105 x 44 mm (L x W x H)
Pump current	5-10 A
Electric	100-240 V AC, 50/60 Hz
Working temperature	15 - 25 °C
Cooling	TEC element + active air cooling



Whether you are setting up your laser experiment or integrating a commercial product, we have competitively high-performance crystals for your needs. Do not hesitate to request custom, if the crystal is not in the standard crystals section.

Crystal

crystals



Laser crystals



Passive Q-switch
crystals



Nonlinear crystals



Raman crystals



Photorefractive
crystals



Laser crystals, glasses and ceramics are used as optical gain sources in solid-state lasers. These media are typically doped with rare-earth ions (e.g. neodymium, ytterbium, or erbium) or transition metal ions (titanium or chromium).

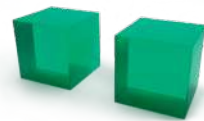
Optogama develops and supplies different laser crystal hosts and ion dopant combinations for fundamental, applied research and industrial applications. Available crystal growth techniques: Stepanov, Modified Flux growth, Kyropoulos and Czochralski.

Laser crystal

r als



Ti:Sapphire



Cr:LiSAF



Pr:YLF



Ho:YLF



Tm, Ho:KYW



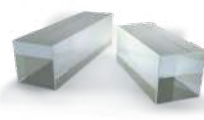
Nd-doped



Yb-doped



Er-doped

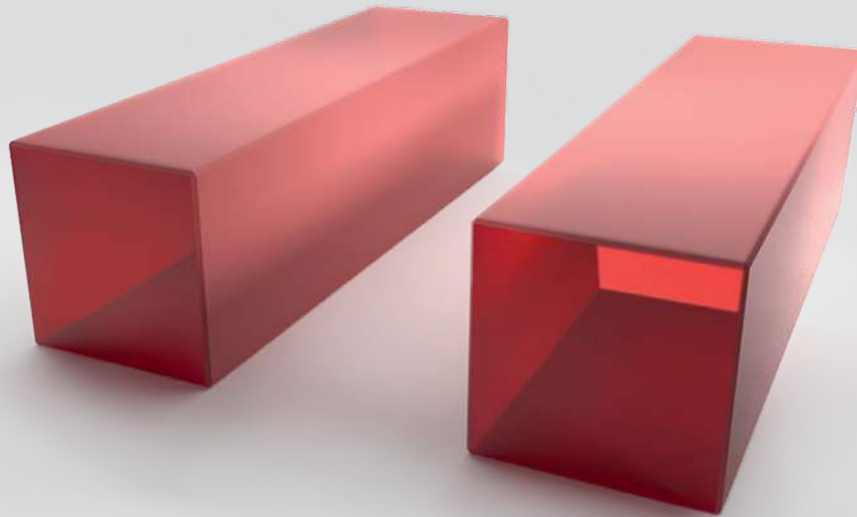


Er, Yb co-doped



Tm-doped

Ti:Sapphire crystals



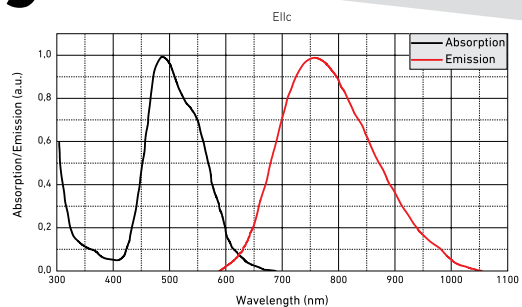
Main features

- Excellent thermal conductivity
- Broad gain bandwidth
- Wide range of possible pump wavelengths (typically 532 nm)
- Custom crystals available upon request

Application examples

- Mode-locked lasers with ultrashort pulses
- Multi-pass amplifiers and regenerative amplifiers

Titanium-doped sapphire ($\text{Ti}^{3+}:\text{Al}_2\text{O}_3$) is a widely used transition-metal-doped laser crystal. Ti^{3+} ion has a very large gain bandwidth, that opens possibility to obtain very wide wavelength tunability realized in short pulse lasers.



To obtain crystals with good optical quality Ti^{3+} doping concentration should not exceed 0,25 at.%. Ti:Sapphire crystal is characterized by a short upper-state lifetime and a high saturation power. All these properties lead to the necessity of using a strongly focused pump beam.

Standard specifications

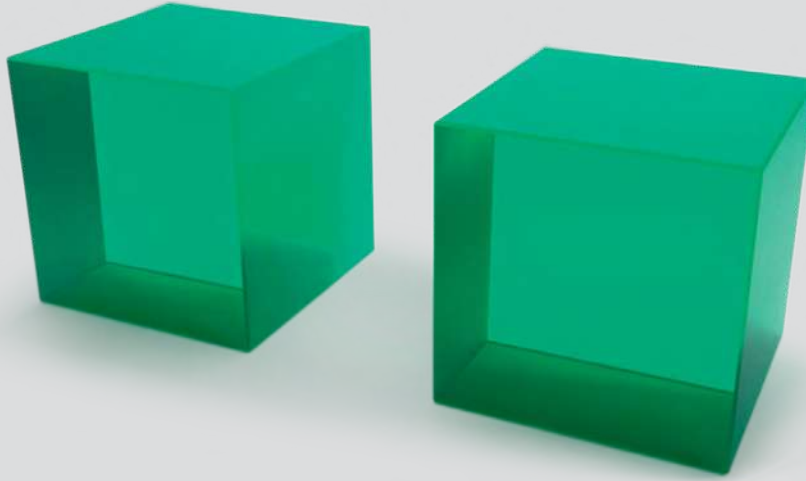
TI:SAPPHIRE CRYSTALS	
Orientation	a-cut
Absorption	90-95% of 532 nm pump radiation
Figure of merit	>150 (for 15 mm and longer crystals)
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<30 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,15 mm at 45°
Surface quality	10-5 5-D
Surface flatness	<λ/10@632,8 nm (for 6x6 mm and smaller crystals)
Wavefront distortion	λ/4@632,8 nm
Coatings	AR(R<1%)@532 nm + AR(R<0,3%)@750-850 nm on both faces
LIDT	>2 J/cm²@800 nm, 300 ps
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	~500 nm
Absorption cross-section at peak wavelength	$38 \times 10^{20} \text{ cm}^2$
Laser wavelength	790 (670-1070) nm
Lifetime of energy level	3,2 μs
Emission cross-section @790 nm	$41 \times 10^{20} \text{ cm}^2$
Refractive index @800 nm	1,76
Crystal structure	hexagonal
Density	3,98 g/cm³
Mohs hardness	9
Thermal conductivity	$33 \text{ Wm}^{-1} \text{ K}^{-1}$
dn/dT	$13 \times 10^{-6} \text{ K}^{-1}$
Thermal expansion coefficient	$5 \times 10^{-6} \text{ K}^{-1}$
Typical doping level	0,1-0,25 at%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	COATINGS	SKU	PRICE
3 x 3 mm	5 mm	Brewster-angle cut	Uncoated	6633	880 €
3 x 3 mm	5 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6632	980 €
6 x 6 mm	7 mm	Brewster-angle cut	Uncoated	6635	980 €
6 x 6 mm	7 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6634	1080 €
6 x 6 mm	10 mm	Brewster-angle cut	Uncoated	6637	980 €
6 x 6 mm	10 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6636	1080 €
6 x 6 mm	15 mm	Brewster-angle cut	Uncoated	6639	1080 €
6 x 6 mm	15 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6638	1180 €
ø6 mm	20 mm	Brewster-angle cut	Uncoated	6641	1080 €
ø6 mm	20 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6648	1180 €
ø12 mm	15 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6640	2150 €
ø16 mm	20 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6642	3950 €
ø20 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6643	4950 €
ø30 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6644	Request
ø40 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6645	Request
ø50 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6646	Request
50 x 50 mm	30 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6647	Request



Cr:LiSAF crystals

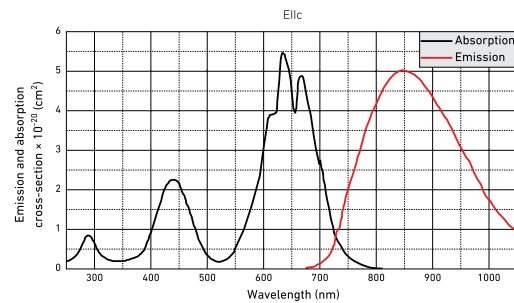
Main features

- Broad absorption and emission bands
- Nonlinear refractive index is about four times lower than that of Ti:Sapphire
- Custom crystals available upon request

Application examples

- Femtosecond lasers and CPA laser systems

Cr³⁺:LiSAF gain medium possesses a broad emission band in the near infrared that allows a widely tunable laser operation and generation of ~10 fs light pulses via mode-locking technique. Cr:LiSAF crystals can be grown with a very low loss level (<0,2%/cm). It enables to construct high-Q-cavities, resulting in lasing thresholds as low as 2 mW and slope efficiencies above 50%. Moreover, nonlinear refractive index of Cr:LiSAF is about four times lower than that of Ti:sapphire, which reduces parasitic nonlinearities in the ultrashort pulse generation and amplification applications.



Standard specifications

CR:LiSAF CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	~λ/10@632,8 nm
Coatings	AR(R<1%)@670 nm + AR(R<0,5%)@700-1100 nm on both faces
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns
Mount	Unmounted

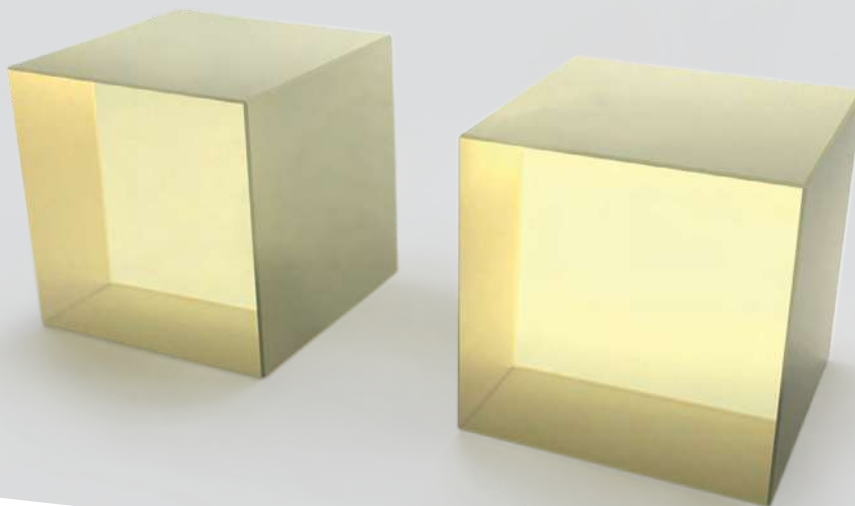
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	670 nm
Absorption cross-section at peak	5,5 × 10 ²⁰ cm ²
Absorption bandwidth at peak wavelength	~100 nm
Laser wavelength	830 (780-920) nm
Lifetime of ⁴ T ₂ energy level	67 μs
Emission cross-section	5 × 10 ²⁰ cm ²
Refractive index	1,41
Crystal structure	trigonal
Density	3,45 kg/cm ³
Mohs hardness	4
Thermal conductivity	4,6(IIa), 5,1 (IIc) Wm ⁻¹ K ⁻¹
dn/dT	-4,2 × 10 ⁻⁶ K ⁻¹ (n _x), -4,6 × 10 ⁻⁶ K ⁻¹ (n _y)
Thermal expansion coefficient	22 × 10 ⁻⁶ (IIa) K ⁻¹ , 3,6 × 10 ⁻⁶ (IIc) K ⁻¹
Typical doping level	0,8-3 at.%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
5 x 5 mm	12 mm	Brewster-angle cut	3%	Uncoated	7820	770 €
		Right-angle cut	3%	AR/AR@670 nm + 700-1100 nm	7819	930 €

Pr:YLF crystals



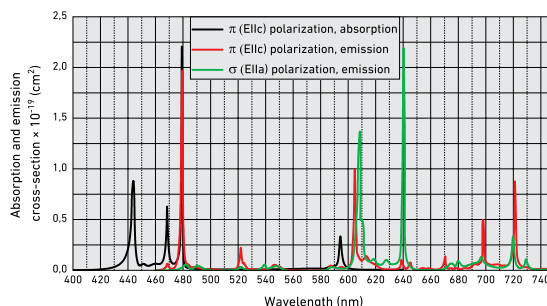
Main features

- High absorption and emission cross-sections ($\sim 10^{-19} \text{ cm}^2$)
- Good overlapping of the absorption band in the blue spectral region with the emission lines of the InGaN laser diodes and 2ω -OPSL
- Custom crystals available upon request

Application examples

- Diode-pumped solid-state lasers for precise and efficient processing of metals such as copper or gold, entertainment industry and science

Very few laser materials have necessary properties for realization of lasing in the visible spectral range. Trivalent praseodymium (Pr^{3+}) is known to be an interesting laser ion for using with solid-state lasers in the visible spectral range because of its energy levels scheme, providing several transitions in the red (640 nm, 3P_0 to 3F_2), orange (607 nm, 3P_0 to 3H_4), green (523 nm, 3P_0 to 3H_5), and dark red (720 nm, 3P_0 ${}^3F_3+{}^3F_4$) spectral regions. Pr^{3+} :YLF has been found to be a promising laser material for producing visible lasers directly and UV lasers through intracavity second-harmonic generation.



Standard specifications

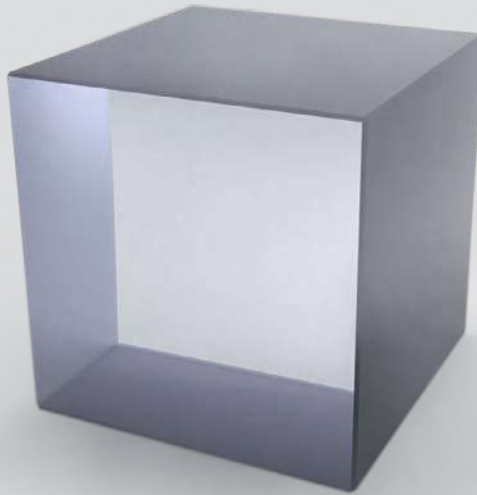
PR:YLF CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	$\pm 0,1$ mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/8$ @632,8 nm
Wavefront distortion	$\lambda/4$ @632,8 nm
Coatings	AR(R<1%)@440-444 nm + AR(R<0,6%)@500-650 nm + AR(R<1%)@650-725 nm on both faces
Laser induced damage threshold	>5 J/cm ² @532 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	444 nm
Absorption cross-section at peak	$8 \times 10^{-20} \text{ cm}^2$
Absorption bandwidth at peak wavelength	~ 5 nm
Laser wavelength	523 nm, 607 nm, 639 nm, 698 nm, 721 nm
Lifetime of 3P_0 energy level	50 μs
Emission cross-section at 640 nm	$20 \times 10^{-20} \text{ cm}^2$
Refractive index @1064 nm	$n_x = 1,448, n_y = 1,470$
Crystal structure	tetragonal
Density	3,95 g/cm ³
Mohs hardness	5
Thermal conductivity	6 Wm ⁻¹ K ⁻¹
dn/dT	$-5,2 \times 10^{-6}$ (c) K ⁻¹ , $-7,6 \times 10^{-6}$ (a) K ⁻¹
Thermal expansion coefficient	$\sim 16 \times 10^{-6}$ K ⁻¹
Typical doping level	<1 at%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
2 x 2 mm	6 mm	Right-angle cut	0,5%	AR/AR@440-444 nm + 500-725 nm	7793	480 €
3 x 3 mm	6 mm	Right-angle cut	0,5%	AR/AR@440-444 nm + 500-725 nm	7794	540 €
$\varnothing 5$ mm	6 mm	Right-angle cut	0,5%	AR/AR@440-444 nm + 500-725 nm	7795	640 €



Ho:YLF crystals

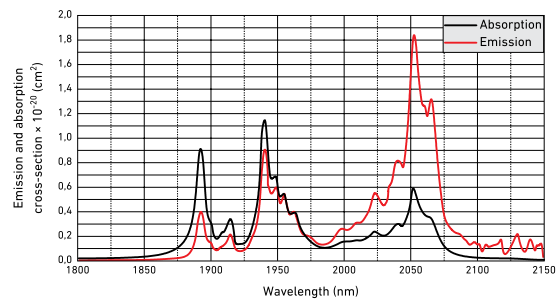
Main features

- Long upper laser level lifetime
- High emission cross-section
- Naturally birefringent material
- Low value of dn/dT leading to a weak thermal lensing
- Custom crystals available upon request

Application examples

- Remote sensing and pollutant detection
- Industry
- Defence

Direct pumping of Ho:YLF crystals excludes losses of Tm^{3+} to Ho^{3+} energy transfer process. Ho:YLF crystal is characterized by a long lifetime of 5I_7 energy level which results in an excellent performance in Q-switched operation.



Standard specifications

HO:YLF CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/10$ @632,8 nm
Coatings	AR(R<0,35%)@1900-2100 nm on both faces
LIDT	>10 J/cm ² @2060 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	1940 nm
Absorption cross-section at peak	$1,2 \times 10^{-20}$ cm ²
Absorption bandwidth at peak wavelength	~18 nm
Laser wavelength	2060 nm
Lifetime of 5I_7 energy level	10 ms
Emission cross-section	$1,8 \times 10^{-20}$ cm ²
Refractive index @1064 nm	$n_o = 1,448$, $n_e = 1,470$
Crystal structure	tetragonal
Density	3,95 g/cm ³
Mohs hardness	5
Thermal conductivity	6 Wm ⁻¹ K ⁻¹
dn/dT	$-4,6 \times 10^{-6}$ (c) K ⁻¹ , $-6,6 \times 10^{-6}$ (a) K ⁻¹
Thermal expansion coefficient	$10,1 \times 10^{-6}$ (c) K ⁻¹ , $14,3 \times 10^{-6}$ (a) K ⁻¹
Typical doping level	0,5-1%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
5 x 5 mm	2 mm	Brewster-angle cut	1%	Uncoated	7857	580 €
	2 mm	Right-angle cut	1%	AR/AR@1900-2100 nm	7858	700 €
	2 mm	Brewster-angle cut	1%	Uncoated	7859	580 €
ø8 mm	2 mm	Right-angle cut	1%	AR/AR@1900-2100 nm	7860	700 €



Tm, Ho:KYW crystals

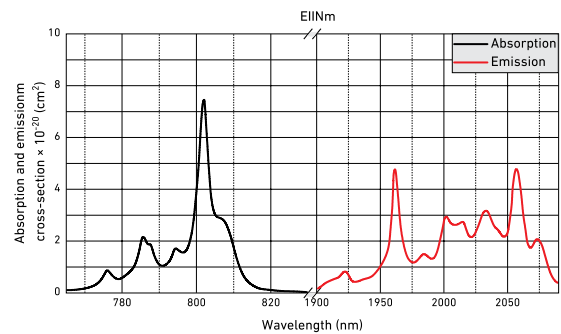
Main features

- Large and broad polarized absorption and emission bands
- Efficient energy transfer from Tm³⁺ to Ho³⁺
- High dopant concentration with low concentration-quenching
- Custom crystals available upon request

Application examples

- 2 μm lasers for remote sensing (LIDAR technology), metrology and medical applications
- Pump source of mid-IR optical parametric oscillators (OPOs)

Ho³⁺ ions are characterized by higher emission cross-sections and longer upper laser level lifetimes compared to their Tm³⁺ counterparts. These features are desirable for a low-threshold and efficient laser operation. Ho³⁺ does not possess any strong absorption lines that are well matched to the outputs of commercially available laser diodes, therefore co-doping of Ho³⁺ with Tm³⁺ is chosen for an efficient operation across the 2 μm region through the energy transfer route from Tm³⁺ to Ho³⁺. Tm, Ho:KYW crystals are characterized by large and broad polarized absorption and emission bands, efficient energy transfer from Tm³⁺ to Ho³⁺.



Standard specifications

TM, HO:KYW CRYSTALS	
Orientation	N _x -cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@802 nm + AR(R<0,2%)@2000-2100 on both faces
LIDT	>10 J/cm ² @2060 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	802 nm
Absorption cross-section at peak	7,6 × 10 ⁻²⁰ cm ²
Absorption bandwidth at peak wavelength	~4 nm
Laser wavelength	2060 nm
Lifetime of ⁵ I ₇ energy level	1,8 ms
Emission cross-section @2056 nm	4,7 × 10 ⁻²⁰ cm ²
Refractive index @1040nm	n _x = 2,05, n _y = 2,01, n _z = 1,97
Crystal structure	monoclinic
Density	6,5 g/cm ³
Mohs hardness	4-5
Thermal conductivity	~3,3 Wm ⁻¹ K ⁻¹
dn _x /dT	dn _x /dT = -9,2 × 10 ⁻⁶ K ⁻¹
Thermal expansion coefficient	α _x = 1,83 × 10 ⁻⁶ K ⁻¹ , α _y = 10,29 × 10 ⁻⁶ K ⁻¹ , α _z = 15,94 × 10 ⁻⁶ K ⁻¹
Typical doping level	5 at.% [Tm] 0,5 at.% [Ho]

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	2 mm	Brewster-angle cut	Tm 5%, Ho 0,5%	Uncoated	7856	Request
		Right-angle cut	Tm 5%, Ho 0,5%	AR/AR@802 nm + 2000-2100 nm	7855	Request



Nd:KGW crystals

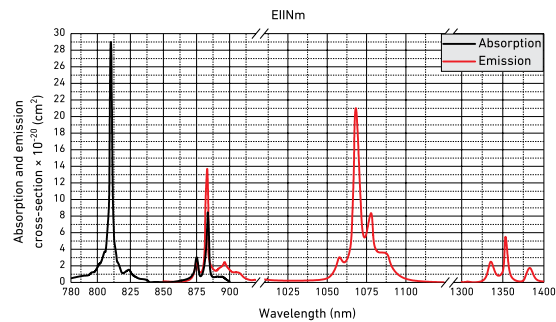
Main features

- Suitable for generation of picosecond light pulses, well suited for diode-pumped lasers
- High storage density and low laser threshold
- Efficient Raman converter
- Custom crystals available upon request

Application examples

- Diode-pumped Q-switched lasers emitting in the "eye-safe" spectral range for laser rangefinders
- Raman converter

Nd:KGW crystal is a good choice for generation of picosecond laser pulses. These crystals are characterized by a lower stimulated emission cross-section compared to Nd:YAG crystals, therefore provide a better performance in Q-switched operation. It is worth to mention, that it is possible to use the Nd:KGW laser crystal itself as a Raman converter.



Standard specifications

ND:KGW CRYSTALS	
Orientation	b(N _z)-cut.
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)808-811 nm + AR(R<0,15%)@1067 nm on both faces
Laser induced damage threshold	>10 J/cm ² @1067 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	811 nm
Absorption cross-section at peak	28 × 10 ²⁰ cm ²
Absorption bandwidth at peak wavelength	11 nm
Laser wavelength	1067 nm
Lifetime of ⁴ F _{3/2} neodymium energy level	130 μs
Emission cross-section @1067 nm	21 × 10 ²⁰ cm ²
Refractive index @1067nm	n _o = 2,033, n _p = 1,937, n _m = 1,986
Crystal structure	Monoclinic
Density	7,25 g/cm ³
Mohs hardness	4-5
Thermal conductivity	~3 Wm ⁻¹ K ⁻¹
dn/dT	dn _o /dT = -15,7×10 ⁻⁶ K ⁻¹ dn _p /dT = -11,8×10 ⁻⁶ K ⁻¹ dn _m /dT = -17,3×10 ⁻⁶ K ⁻¹
Thermal expansion coefficient	α _o = 1,60 × 10 ⁻⁶ K ⁻¹ , α _m = 4 × 10 ⁻⁶ K ⁻¹ , α _p = 8,5 × 10 ⁻⁶ K ⁻¹
Typical doping level	2-10 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	5 mm	Right-angle cut	3%	AR/AR@808-811 nm + 1067 nm	7798	480 €
∅3 mm	60 mm	Right-angle cut	3%	AR/AR@1067 nm	7800	Request
3 x 3 mm	3 mm	Right-angle cut	5%	AR/AR@808-811 nm + 1067 nm	7796	480 €
3 x 3 mm	5 mm	Right-angle cut	5%	AR/AR@808-811 nm + 1067 nm	7797	480 €
∅3 mm	5 mm	Brewster-angle cut	5%	Uncoated	7799	420 €



Nd:YAG crystals

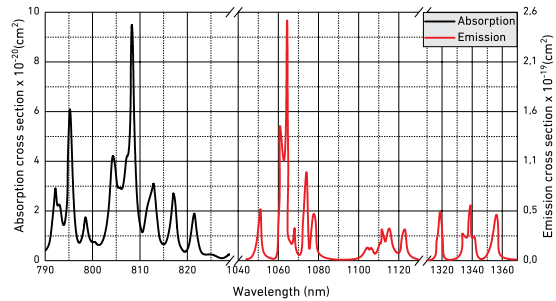
Main features

- Isotropic crystal (cubic symmetry)
- High thermal conductivity
- High optical quality and large diameter boules grown by Czochralski growth method
- Low lasing threshold and wide absorption band at near 808 nm that coincides with the emission of AlGaAs laser diodes
- Custom crystals available upon request

Application examples

- CW and pulsed operation at 1064 nm, 532 nm, 355 nm, 266 nm
- Material processing, welding, cutting
- Laser systems for medical applications

Nd:YAG crystal is the most widely used solid-state laser material. These crystals are characterized by relatively small gain bandwidth, which allows achieving a high gain efficiency and a relatively low lasing threshold. Nd:YAG crystals feature excellent thermal and mechanical properties. Nd:YAG of high optical quality and large diameter can be grown.



Standard specifications

ND:YAG CRYSTALS	
Orientation	[111]
Extinction ratio	>28 dB
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	<λ/8@632,8 nm
Wavefront distortion	λ/4@632,8 nm
Coatings	AR(R<0,15%)@1064 nm on both sides or HT(T>95%)@808 nm + HR(R>99,5%)@1064 nm / AR(R<0,15%)@1064 nm
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	808 nm
Absorption cross-section at peak	$6,7 \times 10^{-20} \text{ cm}^2$
Absorption bandwidth at peak wavelength	2,5 nm
Laser wavelength	1064 nm
Lifetime of $^4F_{3/2}$ neodymium energy level	250 μs
Emission cross-section @1064	$3 \times 10^{-19} \text{ cm}^2$
Refractive index @1064 nm	1,82
Crystal structure	cubic
Density	4,56 g/cm ³
Mohs hardness	8,5
Thermal conductivity	~13 Wm ⁻¹ K ⁻¹
dn/dT	$9,86 \times 10^{-6} \text{ K}^{-1}$
Thermal expansion coefficient	$6,96 \times 10^{-6} \text{ K}^{-1}$
Typical doping level	0,6 - 1,3 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
ø3 mm	10 mm	Right-angle cut	0,8%	AR/AR@1064 nm	7106	260 €
	50 mm	Right-angle cut	0,8%	AR/AR@1064 nm	7071	360 €
	100 mm	Right-angle cut	0,8%	AR/AR@1064 nm	7072	490 €
ø5 mm	10 mm	Right-angle cut	0,8%	AR/AR@1064 nm	7076	280 €
	50 mm	Right-angle cut	0,8%	AR/AR@1064 nm	7077	390 €
	100 mm	Right-angle cut	0,8%	AR/AR@1064 nm	7078	590 €
ø3 mm	10 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7073	260 €
	50 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7074	360 €
	100 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7075	490 €
ø5 mm	10 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7079	280 €
	50 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7080	390 €
	100 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7081	590 €
3 x 3 mm	2 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7082	220 €
	2 mm	Right-angle cut	1,1%	HT@808 nm + HR@1064 nm/AR@1064 nm	7085	240 €
	3 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7083	220 €
	3 mm	Right-angle cut	1,1%	HT@808 nm + HR@1064 nm/AR@1064 nm	7086	240 €
	5 mm	Right-angle cut	1,1%	AR/AR@1064 nm	7084	220 €
	5 mm	Right-angle cut	1,1%	HT@808 nm + HR@1064 nm/AR@1064 nm	7087	240 €

Nd:YLF crystals

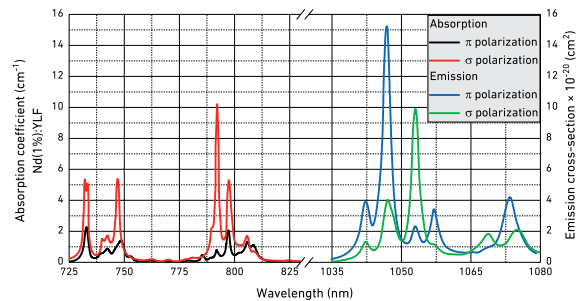
Main features

- Long lifetime of ${}^4F_{3/2}$ neodymium energy level
- Considerably softer and more brittle than Nd:YAG is
- Nd:YLF (a-cut) crystals that are used inside a laser optical resonator are self-polarizing
- Custom crystals available upon request

Application examples

- CW and pulsed operation at 1047nm and 1053 nm
- Material processing, welding, cutting

Nd³⁺:YLF crystal is characterized by a long lifetime of ${}^4F_{3/2}$ neodymium energy level. Compared to Nd:YAG, the lower thermal conductivity and a weak negative dn/dT lead to lower thermal distortions and allow to achieve a better output beam quality. Another distinctive feature is the high UV transparency, which is favorable for pumping with xenon flashlamps.



Standard specifications

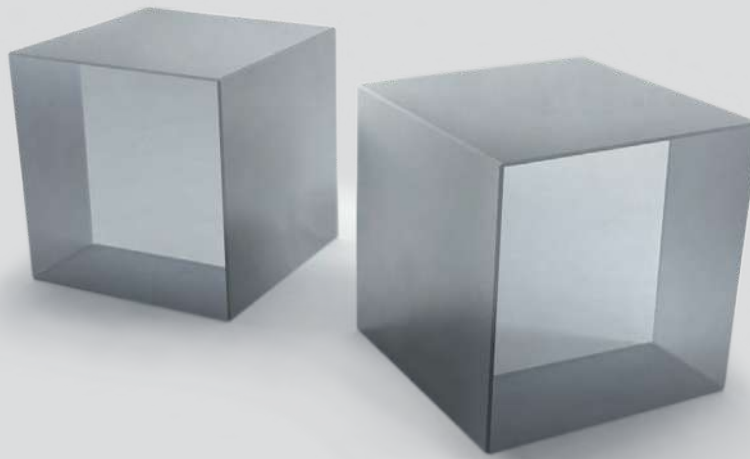
ND:YLF CRYSTALS	
Orientation	a-cut, c-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/8@632,8 nm
Wavefront distortion	λ/4@632,8 nm
Coatings	AR(R<0,5%)@790-810 nm + AR(R<0,2%)@1047-1053 nm on both faces
Laser induced damage threshold	>10 J/cm²@1064 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	792 nm
Absorption coefficient at peak	10 cm ⁻¹
Absorption bandwidth at peak wavelength	~5 nm
Laser wavelength	1047, 1053 nm
Lifetime of ${}^4F_{3/2}$ neodymium energy level	485 μs
Emission cross-section	15 × 10 ⁻²⁰ (E C) cm ² @1047 nm 10 × 10 ⁻²⁰ (E⊥C) cm ² @1053 nm
Refractive index @1064 nm	n _o = 1,448, n _e = 1,470
Crystal structure	tetragonal
Density	3,95 g/cm ³
Mohs hardness	5
Thermal conductivity	6 Wm ⁻¹ K ⁻¹
dn/dT	-4,6 × 10 ⁻⁶ (c) K ⁻¹ , -6,6 × 10 ⁻⁶ (a) K ⁻¹
Thermal expansion coefficient	8 × 10 ⁻⁶ (c) K ⁻¹ , 13 × 10 ⁻⁶ (a) K ⁻¹
Typical doping level	1-2 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	ORIENTATION	DOPING	COATINGS	SKU	PRICE
ø5 mm	10 mm	Right-angle cut	a-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7097	540 €
	20 mm	Right-angle cut	a-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7098	640 €
	50 mm	Right-angle cut	a-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7099	Request
	100 mm	Right-angle cut	a-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7100	Request
	10 mm	Right-angle cut	c-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7101	580 €
	20 mm	Right-angle cut	c-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7102	680 €
	50 mm	Right-angle cut	c-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7103	Request
	100 mm	Right-angle cut	c-cut	1%	AR/AR@790-810 nm + 1047-1053 nm	7104	Request



Nd:YVO₄ crystals

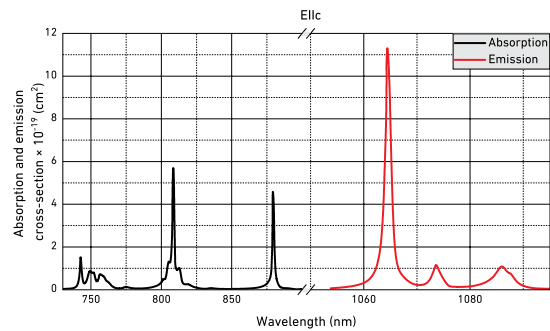
Main features

- High absorption and gain cross-sections
- Strongly polarization dependent absorption and emission spectra (π -polarization is preferable)
- Shorter (compared with Nd:YAG) upper-state lifetime
- High optical quality and large diameter boules obtained by Czochralski growth method
- Custom crystals available upon request

Application examples

- High repetition rate Q-switched lasers for marking and engraving
- Mode-locked lasers for spectroscopy and research

Compared to Nd³⁺:YAG crystals, the Nd³⁺:YVO₄ crystal has much higher absorption and emission cross-sections, a broader gain bandwidth and wavelength range for pumping, a shorter upper-state lifetime, a higher refractive index, thus it is characterized by a lower thermal conductivity. Nd:YVO₄ crystals are well suited for passively mode-locked lasers with high pulse repetition rates.



A drawback of Nd:YVO₄ lasers is that it is impossible to achieve pulse energies as high as it is achievable with Nd:YAG lasers at Q-switched operation, due to the lower upper-state lifetime and higher gain efficiency. In conclusion, Nd:YVO₄ is better suited as an active medium of high pulse repetition rate Q-switched lasers and CW lasers with a lower lasing threshold.

Standard specifications

ND:YVO ₄ CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/8$ @632.8 nm
Coatings	AR(R<0,5%)@808 nm + AR(R<0,15%)@1064 nm and HT(T>95%)@ + HR(R>99,8%)@1064 nm/AR(R<0,2%)@1064 nm
Laser induced damage threshold	>10 J/cm ² @1064nm, 10 ns
Mount	Unmounted

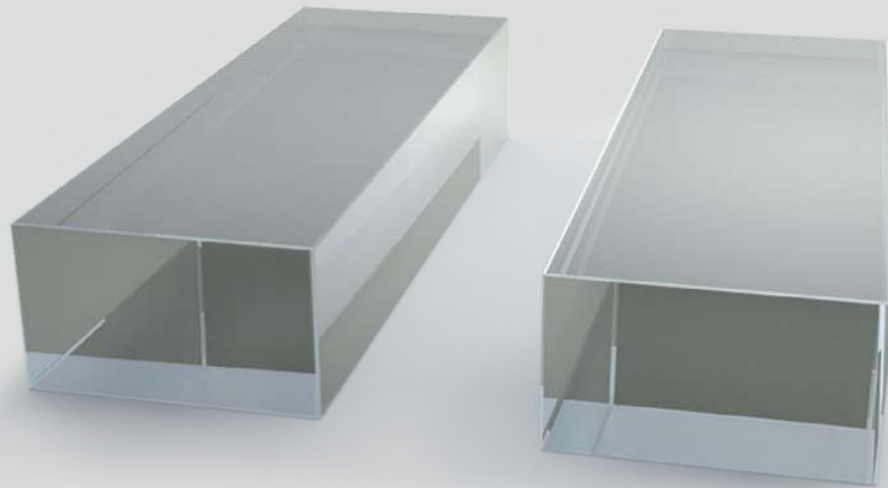
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	808 nm
Absorption cross-section at peak	$5,8 \times 10^{-19} \text{ cm}^2$
Absorption bandwidth at peak wavelength	16 nm
Laser wavelength	1064 nm
Lifetime of ⁴ F _{3/2} neodymium energy level	90 μs
Emission cross-section @1064 nm	$11,4 \times 10^{-19} \text{ cm}^2$
Refractive index @1064 nm	$n_o = 1,96, n_e = 2,17$
Crystal structure	Tetragonal
Density	4,22 g/cm ³
Mohs hardness	5
Thermal conductivity	-5 Wm ⁻¹ K ⁻¹
dn/dT	$3,0 \times 10^{-6} \text{ (c) K}^{-1}, 8,5 \times 10^{-6} \text{ (a) K}^{-1}$
Thermal expansion coefficient	$11 \times 10^{-6} \text{ (c) K}^{-1}, 4,4 \times 10^{-6} \text{ (a) K}^{-1}$
Typical doping level	0,1-4 at.%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	5 mm	Right-angle cut	1%	AR/AR@808 nm + 1064 nm	7105	280 €
		Right-angle cut	1%	HT@808 nm + HR@1064 nm/AR@1064 nm	7092	350 €
	2 mm	Right-angle cut	2%	AR/AR@808 nm + 1064 nm	7089	280 €
		Right-angle cut	2%	HT@808 nm + HR@1064 nm/AR@1064 nm	7094	350 €
	3 mm	Right-angle cut	2%	AR/AR@808 nm + 1064 nm	7088	280 €
		Right-angle cut	2%	HT@808 nm + HR@1064 nm/AR@1064 nm	7093	350 €
	0,5 mm	Right-angle cut	3%	AR/AR@808 nm + 1064 nm	7091	280 €
		Right-angle cut	3%	HT@808 nm + HR@1064 nm/AR@1064 nm	7096	350 €
	1 mm	Right-angle cut	3%	AR/AR@808 nm + 1064 nm	7090	280 €
		Right-angle cut	3%	HT@808 nm + HR@1064 nm/AR@1064 nm	7095	350 €

Yb:KGW crystals



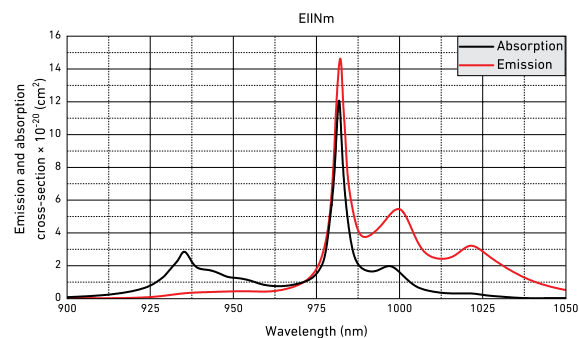
Main features

- Large gain bandwidth
- High emission cross-sections
- Small quantum defect
- High doping level
- High thermal conductivity
- Custom crystals available upon request

Application examples

- Femtosecond lasers and regenerative amplifiers
- CW and passively mode-locked thin-disk lasers

Yb³⁺:KGW crystals possess a large gain bandwidth that enables to obtain <100 fs pulse duration in mode-locked regime of operation. Compared with other ytterbium-doped gain media with a similarly large gain bandwidth, ytterbium-doped tungstate has fairly high emission cross-sections. Ytterbium doping concentration in Yb:KGW crystals can be up to 5 at. % without a significant quenching. Thermal conductivity of common double tungstates is in the range of 3–4 Wm⁻¹K⁻¹. Yb:KGW crystals exhibit a small quantum defect and it is possible to operate with a quantum defect well below ~4–5%.



Standard specifications

YB:KGW CRYSTALS	
Orientation	Ng-cut; Np(b)-cut and other orientation available
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@970-1070 nm
Laser induced damage threshold	>10 J/cm²@1040 nm, 10 ns
Mount	Unmounted

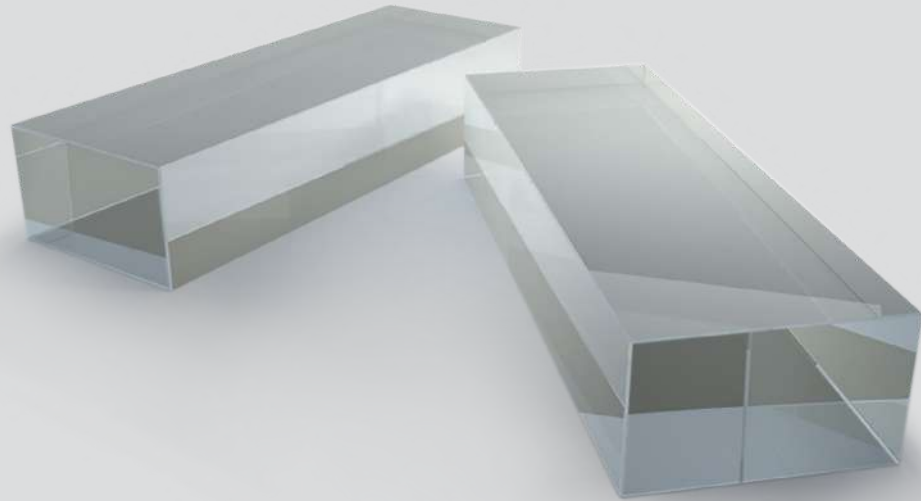
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	980 nm
Absorption cross-section at peak wavelength	$12 \times 10^{-20} \text{ cm}^2$ (E N _g)
Absorption bandwidth at peak wavelength	3,7 nm
Laser wavelength	1025 (1020-1060) nm
Lifetime of ² F _{5/2} ytterbium energy level	240 μs
Emission cross-section at 1030 nm	$3 \times 10^{-20} \text{ cm}^2$ (E N _g)
Refractive index at 1064 nm	n _g = 2,037 n _s = 1,986 n _m = 2,033
Crystal structure	Monoclinic
Density	7,25 g/cm³
Mohs hardness	4-5
Thermal conductivity	K _g = 2,6 Wm ⁻¹ K ⁻¹ K _s = 3,8 Wm ⁻¹ K ⁻¹ K _m = 3,4 Wm ⁻¹ K ⁻¹
dn/dT	dn _g /dT = -15,7 × 10 ⁻⁶ K ⁻¹ dn _s /dT = -11,8 × 10 ⁻⁶ K ⁻¹ dn _m /dT = -17,3 × 10 ⁻⁶ K ⁻¹
Thermal expansion coefficient	α _g = 1,7 × 10 ⁻⁶ K ⁻¹ α _s = 11,01 × 10 ⁻⁶ K ⁻¹ α _m = 17,37 × 10 ⁻⁶ K ⁻¹
Typical doping level	1-5 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	10 mm	Brewster-angle cut	1%	Uncoated	7051	540 €
	10 mm	Right-angle cut	1%	AR/AR@970-1070 nm	7049	590 €
5 x 5 mm	10 mm	Brewster-angle cut	1%	Uncoated	7052	540 €
	10 mm	Right-angle cut	1%	AR/AR@970-1070 nm	7050	590 €
3 x 3 mm	5 mm	Brewster-angle cut	2%	Uncoated	7055	540 €
	5 mm	Right-angle cut	2%	AR/AR@970-1070 nm	7053	590 €
5 x 5 mm	5 mm	Brewster-angle cut	2%	Uncoated	7056	540 €
	5 mm	Right-angle cut	2%	AR/AR@970-1070 nm	7054	590 €
3 x 3 mm	3 mm	Brewster-angle cut	3%	Uncoated	7059	540 €
	3 mm	Right-angle cut	3%	AR/AR@970-1070 nm	7057	590 €
5 x 5 mm	3 mm	Brewster-angle cut	3%	Uncoated	7060	540 €
	3 mm	Right angle cut	3%	AR/AR@970-1070 nm	7058	590 €
3 x 3 mm	2 mm	Brewster-angle cut	5%	Uncoated	7063	540 €
	2 mm	Right-angle cut	5%	AR/AR@970-1070 nm	7061	590 €
5 x 5 mm	2 mm	Brewster-angle cut	5%	Uncoated	7064	540 €
	2 mm	Right-angle cut	5%	AR/AR@970-1070 nm	7062	590 €

Yb:KYW crystals



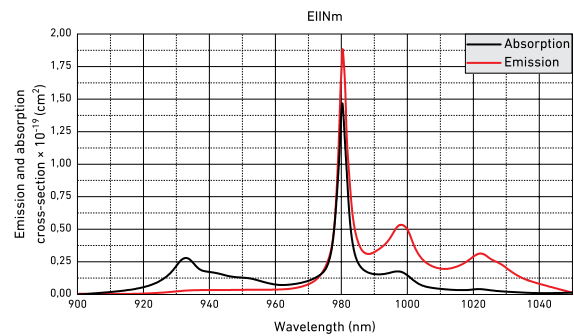
Main features

- Large gain bandwidth
- High emission cross-sections
- Small quantum defect
- High doping level
- High thermal conductivity
- Custom crystals available upon request

Application examples

- Femtosecond lasers and regenerative amplifiers
- CW and passively mode-locked thin-disk lasers

Yb³⁺:KYW crystals possess a large gain bandwidth that enables to obtain <100 fs pulse duration in mode-locked regime of operation. Compared with other ytterbium-doped gain media with a similarly large gain bandwidth, ytterbium-doped tungstates have fairly high emission cross-sections. Ytterbium doping concentration in Yb:KYW crystals can be very high without a significant quenching. Thermal conductivity of common double tungstates is in the range of 3–4 Wm⁻¹K⁻¹. Yb:KYW crystals also feature a small quantum defect.



Standard specifications

YB:KYW CRYSTALS	
Orientation	Ng-cut; Np(b)-cut and other orientation available
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@970-1070 nm
Laser induced damage threshold	>10 J/cm ² @1040 nm, 10 ns
Mount	Uncoated

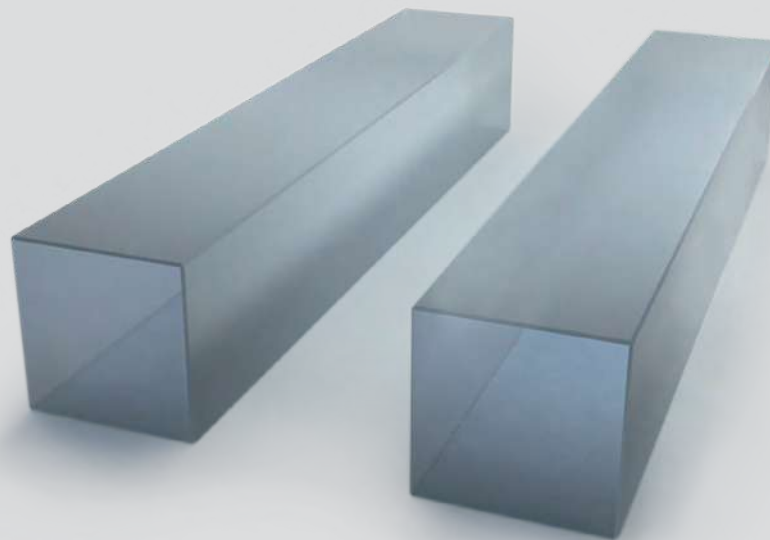
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	980 nm
Absorption cross-section at peak wavelength	14 × 10 ⁻²⁰ cm ² (E N _g)
Absorption bandwidth at peak wavelength	~3 nm
Laser wavelength	1020 (1020-1050) nm
Lifetime of ² F _{5/2} ytterbium energy level	230 μs
Emission cross-section at 1030 nm	2,5 × 10 ⁻²⁰ cm ² (E N _g)
Refractive index at 1064 nm	n _g = 2,037 n _p = 1,986 n _m = 2,033
Crystal structure	Monoclinic
Density	6,61 g/cm ³
Mohs hardness	4-5
Thermal conductivity	~3,3 Wm ⁻¹ K ⁻¹
dn/dT	dn _g /dT = -13,08 × 10 ⁻⁶ K ⁻¹ dn _m /dT = -7,61 × 10 ⁻⁶ K ⁻¹ dn _p /dT = -11,83 × 10 ⁻⁶ K ⁻¹
Thermal expansion coefficient	α _g = 1,9 × 10 ⁻⁶ K ⁻¹ α _m = 10,3 × 10 ⁻⁶ K ⁻¹ α _p = 16,5 × 10 ⁻⁶ K ⁻¹
Typical doping level	1-100 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	5 mm	Brewster-angle cut	2%	Uncoated	7037	540 €
	5 mm	Right-angle cut	2%	AR/AR@970-1070 nm	7035	590 €
5 x 5 mm	5 mm	Brewster-angle cut	2%	Uncoated	7038	540 €
	5 mm	Right-angle cut	2%	AR/AR@970-1070 nm	7036	590 €
3 x 3 mm	2 mm	Brewster-angle cut	5%	Uncoated	7039	540 €
	2 mm	Right-angle cut	5%	AR/AR@970-1070 nm	7041	590 €
5 x 5 mm	2 mm	Brewster-angle cut	5%	Uncoated	7042	540 €
	2 mm	Right-angle cut	5%	AR/AR@970-1070 nm	7040	590 €
3 x 3 mm	1 mm	Brewster-angle cut	10%	Uncoated	7045	540 €
	1 mm	Right-angle cut	10%	AR/AR@970-1070 nm	7043	590 €
5 x 5 mm	1 mm	Brewster-angle cut	10%	Uncoated	7046	540 €
	1 mm	Right-angle cut	10%	AR/AR@970-1070 nm	7044	590 €

Yb:YAG crystals



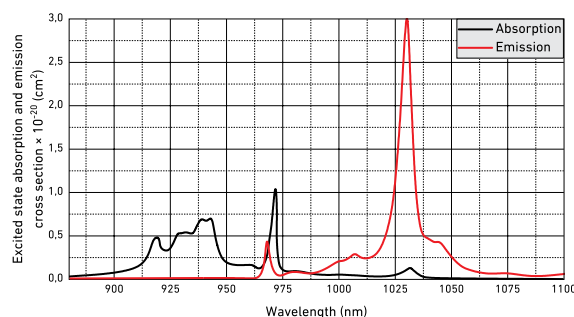
Main features

- Simple electronic structure excludes excited-state absorption and also a variety of detrimental quenching processes
- Broad absorption band at 940 nm
- Long lifetime of the ${}^2F_{5/2}$ ytterbium energy level
- Low quantum defect
- Custom crystals available upon request

Application examples

- Material processing, micromachining, welding, cutting
- Efficient high power thin-disk lasers

Yb³⁺:YAG crystals feature a 950 μ s lifetime of the ${}^2F_{5/2}$ ytterbium energy level and a quantum defect of only ~9%. Yb:YAG crystals also possess a broad pump band at near 940 nm that is more than 10 times broader than the 808 nm pump line of Nd:YAG crystals. It makes Yb:YAG systems less sensitive to thermal shift of pump diodes wavelength. Yb:YAG lasers emit typically at either 1030 nm (strongest line) or 1050 nm. It is often used in powerful and efficient thin-disk lasers.



Standard specifications

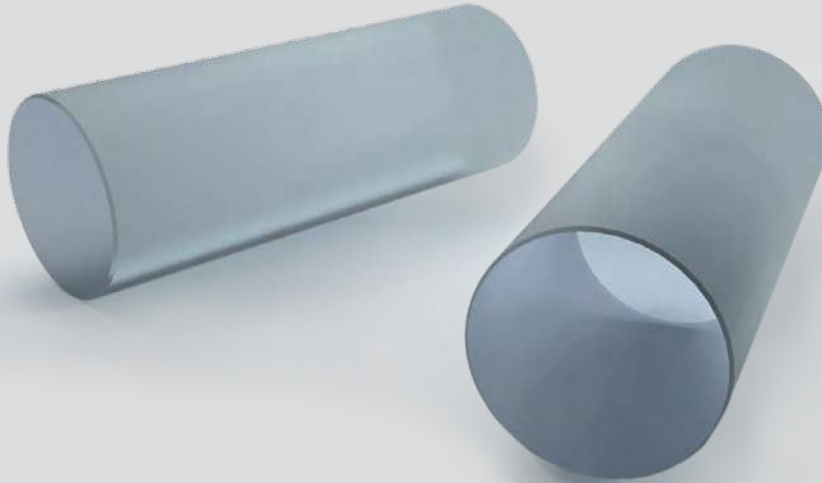
YB:YAG CRYSTALS	
Orientation	[111]
Extinction ratio	>28 dB
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	$\pm 0,1$ mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,15 mm at 45°
Surface quality	10-5 S-D
Surface flatness	< $\lambda/10$ @632,8 nm
Wavefront distortion	$\lambda/4$ @632,8 nm
Coatings	AR(R<0,5%)@940 nm + AR(R<0,2%)@1030 nm on both faces
Laser induced damage threshold	>10 J/cm ² @1030 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	942 nm
Absorption cross-section at peak wavelength	$7,7 \times 10^{-21}$ cm ²
Absorption bandwidth at peak wavelength	18 nm
Laser wavelength	1030 nm
Lifetime of ${}^2F_{5/2}$ ytterbium energy level	950 μ s
Emission cross-section @1030 nm	$2,1 \times 10^{-20}$ cm ²
Refractive index @632,8 nm	1,83
Crystal structure	Cubic
Density	4,56 g/cm ³
Mohs hardness	8,5
Thermal conductivity	~ 13 Wm ⁻¹ K ⁻¹
dn/dT	$7,8 \times 10^{-6}$ K ⁻¹
Thermal expansion coefficient	$6,2 \times 10^{-6}$ K ⁻¹
Typical doping level	1-20 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
5 x 5 mm	10 mm	Brewster-angle cut	1%	Uncoated	6664	500 €
		Right-angle cut	1%	AR/AR@940 nm + 1030 nm	6661	540 €
	2 mm	Brewster-angle cut	5%	Uncoated	6663	500 €
		Right-angle cut	5%	AR/AR@940 nm + 1030 nm	6660	540 €
	1 mm	Brewster-angle cut	10%	Uncoated	6662	500 €
		Right-angle cut	10%	AR/AR@940 nm + 1030 nm	6659	540 €



Yb:CaF₂ crystals

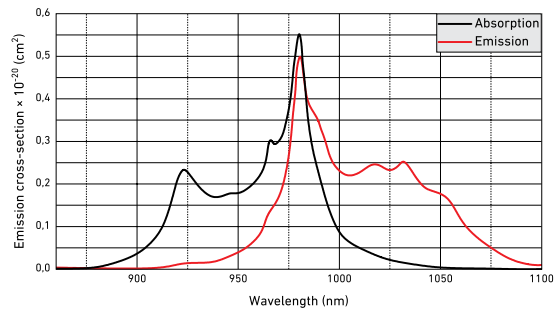
Main features

- Isotropic crystal (cubic symmetry)
- Low quantum defect
- Long lifetime of the ²F_{5/2} ytterbium energy level
- Wide optical transmission
- Low dispersion behavior
- Limited nonlinear effects under intense laser irradiation
- Custom crystals available upon request

Application examples

- Diode-pumped femtosecond solid-state lasers aiming at the generation of high-energy pulses
- Ultrashort pulses with high average power

Yb³⁺:CaF₂ are among most studied and promising crystals for the development of short-pulse, high-energy, high-power diode-pumped solid-state lasers. There are several reasons that explain this trend. Firstly, calcium fluoride is a simple cubic crystal whose crystallographic properties are fairly well known. Moreover, this crystal can be grown of large dimension and optical quality. The simple structure of this crystal contributes to its good thermal properties. Finally, Yb-doped calcium fluorides feature very broad and smooth emission bands, which is exceptional for cubic crystals.



Standard specifications

YB:CAF ₂ CRYSTALS	
Orientation	[111]
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,15 mm at 45°
Surface quality	20-10 5-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@980 nm + AR(R< 0,2%)@1040-1070 nm
Laser induced damage threshold	>10 J/cm ² @1040 nm, 10 ns
Mount	Unmounted

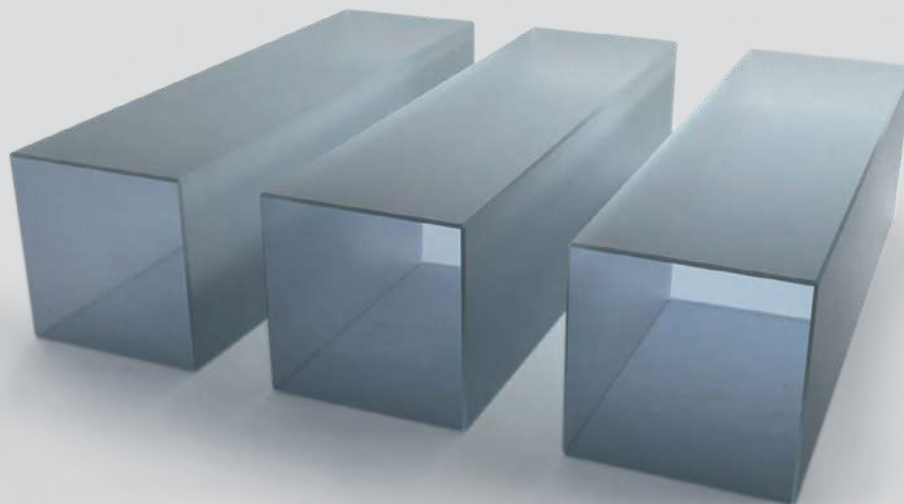
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	976 nm
Absorption cross-section at peak	0,54 × 10 ⁻²⁰ cm ²
Laser wavelength	1020-1060 nm
Lifetime of ² F _{5/2} energy level	2,4 ms
Emission cross-section @1053 nm	0,16 × 10 ⁻²⁰ cm ²
Refractive index @1040nm	1,43
Crystal structure	cubic
Density	3,18 g/cm ³
Mohs hardness	4
Thermal conductivity	5,4 Wm ⁻¹ K ⁻¹
dn/dT	-11,3 × 10 ⁻⁶ K ⁻¹
Thermal expansion coefficient	18,9 × 10 ⁻⁶ K ⁻¹
Typical doping level	1-5 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
ø3 mm	10 mm	Brewster-angle cut	1%	Uncoated	7032	540 €
		Right-angle cut	1%	AR/AR@980 nm + 1040-1070 nm	7029	590 €
	5 mm	Brewster-angle cut	3%	Uncoated	7031	540 €
		Right-angle cut	3%	AR/AR@980 nm + 1040-1070 nm	7028	590 €
	3 mm	Brewster-angle cut	5%	Uncoated	7030	540 €
		Right-angle cut	5%	AR/AR@980 nm + 1040-1070 nm	7027	590 €

Yb:YAB crystals



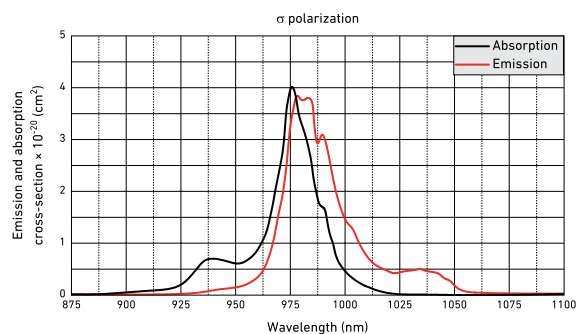
Main features

- Self-doubling laser crystal
- High thermal conductivity
- Wide absorption bandwidth near 976 nm
- High absorption and emission cross-sections
- Low quantum defect
- Custom crystals available upon request

Application examples

- High power CW lasers
- Mode-locked femtosecond lasers
- CW and mode-locked self-doubling lasers

Yb³⁺:YAB is one of the few representatives with multifunctional properties: as a negative uniaxial crystal, it also possesses nonlinear optical properties, permitting a direct conversion of the infrared radiation to the visible through second order nonlinear processes. High concentrations of Yb³⁺ ions can be included in the YAB crystal matrix with little concentration quenching. Yb:YAB crystals feature good mechanical strength, good thermal conductivity, and stable chemical characteristics.



Standard specifications

YB:YAB CRYSTALS	
Orientation	c-cut, a-cut available
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	Antireflective (AR) coatings on both faces
Laser induced damage threshold	>10 J/cm ² @1030 nm, 10 ns (for AR/AR@960-1060 nm coatings)
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	976 nm
Absorption cross-section at peak	3,8 × 10 ²⁰ cm ⁻²
Absorption bandwidth at peak wavelength	20 nm
Laser wavelength	1040 nm
Lifetime of ² F _{5/2} energy level	680 μs
Emission cross-section @1040 nm	0,5 × 10 ²⁰ cm ⁻²
Refractive index @632,8 nm	n _o =1,7757, n _e =1,7015
Crystal structure	Trigonal
Density	3,84 g/cm ³
Mohs hardness	7,5
Thermal conductivity	~6 Wm ⁻¹ K ⁻¹
dn/dT	1,4 × 10 ⁻⁶ (IIa) K ⁻¹ , 4,8 × 10 ⁻⁶ (IIc) K ⁻¹
Thermal expansion coefficient	2 × 10 ⁻⁶ (IIa) K ⁻¹ , 9,5 × 10 ⁻⁶ (IIc) K ⁻¹
Typical doping level	10 at%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	ORIENTATION	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	2 mm	Right-angle cut	c-cut	10%	AR/AR@960-1060 nm	12826	Request
		Brewster-angle cut	c-cut	10%	Uncoated	12827	Request
		Right-angle cut	θ = 31°, φ = 0°	10%	AR/AR@520+976+1040 nm	12828	Request



Yb:YAP crystals

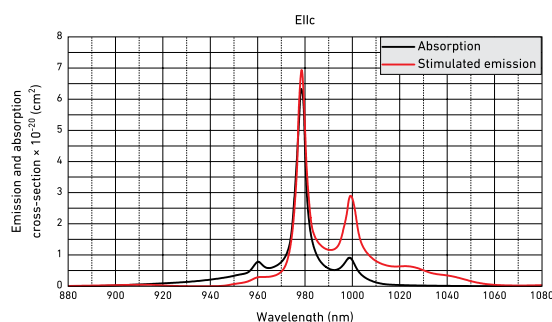
Main features

- Biaxial orthorhombic crystal
- High absorption cross-section dependent upon the crystallographic orientation
- High thermal conductivity
- Low quantum defect
- Custom crystals available upon request

Application examples

- Femtosecond lasers and regenerative amplifiers
- CW and passively mode-locked thin-disk lasers

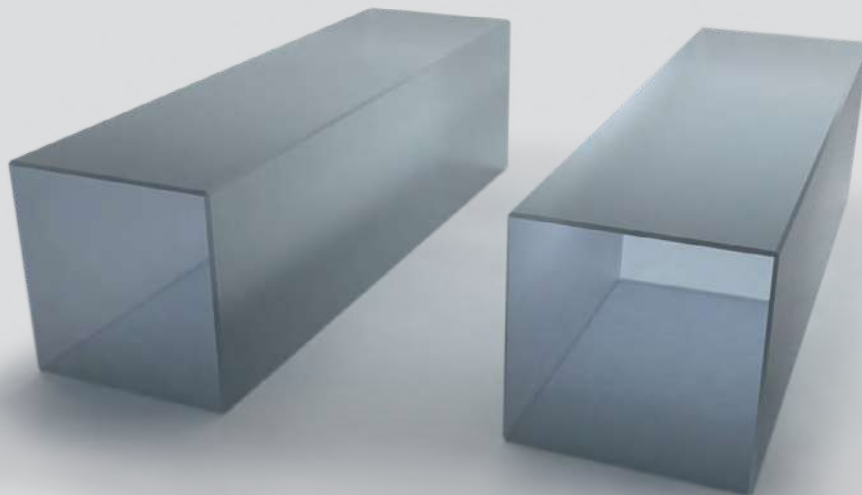
Yttrium aluminate doped with Yb³⁺, (Yb³⁺YAP) is a biaxial orthorhombic crystal. YAP crystal hardness and thermal conductivity are similar to YAG but exhibits a highly anisotropic thermal expansion coefficient and is birefringent. Emission wavelengths are polarized, while emission and absorption cross-sections are strongly dependent upon the crystallographic orientation. The absorption cross-sections of the Yb:YAP crystal is higher than that of the Yb:YAG crystal.



Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	978 nm
Absorption cross-section at peak	$6,6 \times 10^{-20} \text{ cm}^2$
Absorption bandwidth at peak wavelength	4 nm
Laser wavelength	1040 nm
Lifetime of ³ F _{4/2} energy level	500 μs
Emission cross-section @1040 nm	$0,5 \times 10^{-20} \text{ cm}^2$
Refractive index @632.8 nm	1,96 (IIa), 1,94 (IIb), 1,97 (IIc)
Crystal structure	orthorhombic
Density	5,35 g/cm ³
Mohs hardness	8,5
Thermal conductivity	11,7 (IIa), 10,0 (IIb), 13,3 (IIc) Wm ⁻¹ K ⁻¹
dn/dT	$7,7 \times 10^{-6}$ (IIa) K ⁻¹ , $11,7 \times 10^{-6}$ (IIb) K ⁻¹ , $8,3 \times 10^{-6}$ (IIc) K ⁻¹
Thermal expansion coefficient	$2,32 \times 10^{-6}$ (IIa) K ⁻¹ , $8,08 \times 10^{-6}$ (IIb) K ⁻¹ , $8,7 \times 10^{-6}$ (IIc) K ⁻¹
Typical doping level	<2 at. %

Yb:YLF crystals

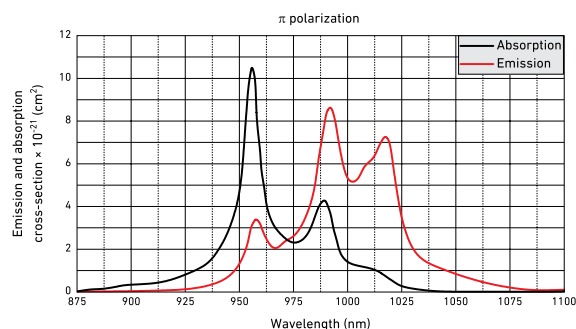


Main features

- Simple electronic structure excludes excited-state absorption and also a variety of detrimental quenching processes
- Broad and smooth emission spectrum
- Wide tuning range
- Absorption spectra are well matched with the emission wavelength of InGaAs laser diodes
- Low quantum defect
- Custom crystals available upon request

Application examples

- Diode-pumped mode-locked lasers
- Thin-disk lasers



Standard specifications

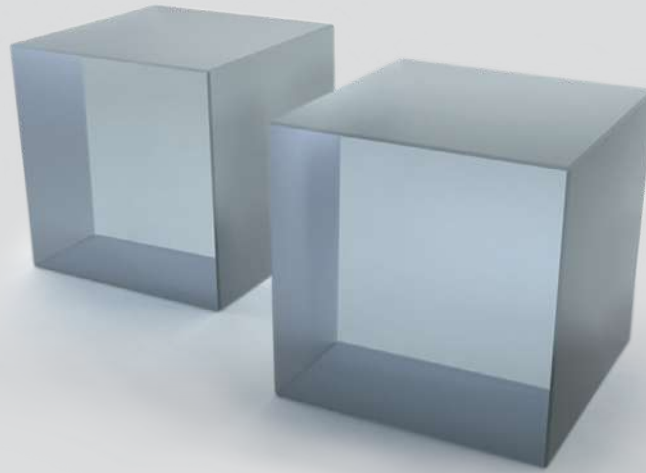
YB:YLF CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@960 nm + AR(R<0,2%)@1000-1060 nm on both faces
Laser induced damage threshold	>10 J/cm²@1030 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	960 nm
Absorption cross-section at peak	$10,5 \times 10^{-21} \text{ cm}^2$
Absorption bandwidth at peak wavelength	~10 nm
Laser wavelength	1017 nm
Lifetime of ${}^2F_{5/2}$ energy level	2,1 ms
Emission cross-section @1053 nm	$4,1 \times 10^{-21} \text{ cm}^2$
Refractive index @1040nm	~1,4
Crystal structure	tetragonal
Density	3,95 g/cm³
Mohs hardness	5
Thermal conductivity	6 Wm⁻¹K⁻¹
dn/dT	$-4,6 \times 10^{-6} \text{ (IIC) K}^{-1}, -6,6 \times 10^{-6} \text{ (IIa) K}^{-1}$
Thermal expansion coefficient	$8 \times 10^{-6} \text{ (IIC) K}^{-1}, 13 \times 10^{-6} \text{ (IIa) K}^{-1}$
Typical doping level	5-20 at.%

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	8 mm	Right-angle cut	5%	AR/AR@960 nm + 1000-1060 nm	7828	590 €
3 x 3 mm	8 mm	Brewster-angle cut	5%	Uncoated	7829	540 €
ø8 mm	8 mm	Right-angle cut	5%	AR/AR@960 nm + 1000-1060 nm	7830	680 €
3 x 3 mm	4 mm	Brewster-angle cut	10%	Uncoated	7832	540 €
3 x 3 mm	4 mm	Right-angle cut	10%	AR/AR@960 nm + 1000-1060 nm	7831	590 €
ø8 mm	4 mm	Right-angle cut	10%	AR/AR@960 nm + 1000-1060 nm	7833	680 €
3 x 3 mm	2 mm	Brewster-angle cut	20%	Uncoated	7835	540 €
3 x 3 mm	2 mm	Right-angle cut	20%	AR/AR@960 nm + 1000-1060 nm	7834	590 €
ø8 mm	2 mm	Right-angle cut	20%	AR/AR@960 nm + 1000-1060 nm	7836	680 €



Yb:YVO₄ crystals

Main features

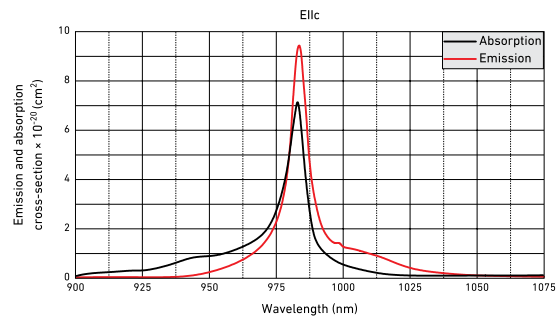
- The simple electronic structure excludes excited-state absorption and also a variety of detrimental quenching processes
- Broad and smooth emission spectrum
- Low quantum defect
- Custom crystals available upon request

Application examples

- High power CW, Q-switched and mode-locked lasers
- Thin-disk lasers

Optogama does not provide standard product list. Please contact us for solutions and pricing.

Yb³⁺:YVO₄ crystal has a broad and smooth emission spectrum that allows wide wavelength tuning ranges and generating ultrashort pulses in mode-locked lasers. Due to good thermal conductivity Yb:YVO₄ crystals can be used as an active medium in high-power thin-disk lasers.



Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	985 nm
Absorption cross-section at peak	$7,5 \times 10^{-20} \text{ cm}^2$
Absorption bandwidth at peak wavelength	5 nm
Laser wavelength	1027 nm
Lifetime of ² F _{5/2} ytterbium energy level	250 μs
Emission cross-section @1027 nm	$0,5 \times 10^{-20} \text{ cm}^2$
Refractive index @1064 nm	$n_o = 1,93, n_e = 2,1$
Crystal structure	Tetragonal
Density	4,22 g/cm ³
Mohs hardness	5
Thermal conductivity	$-5 \text{ Wm}^{-1}\text{K}^{-1}$
dn/dT	$8,41 \times 10^{-6} \text{ (IIC) K}^{-1}, 15,5 \times 10^{-6} \text{ (IIa) K}^{-1}$
Thermal expansion coefficient	$1,5 \times 10^{-6} \text{ (IIa) K}^{-1}, 8,2 \times 10^{-6} \text{ (IIC) K}^{-1}$
Typical doping level	1-3 at.%



Er:KYW crystals

Main features

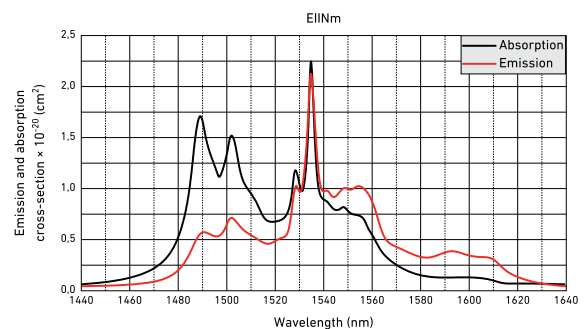
- Strong absorption bandwidth near 1534 nm corresponding to InGaAsP/ InP laser diode emission
- Wide emission bandwidth near 1600 nm
- Custom crystals available upon request

Application examples

- In-band pumped "eye-safe" CW, Q-switched and mode-locked lasers
- In-band pumped "eye-safe" waveguide lasers

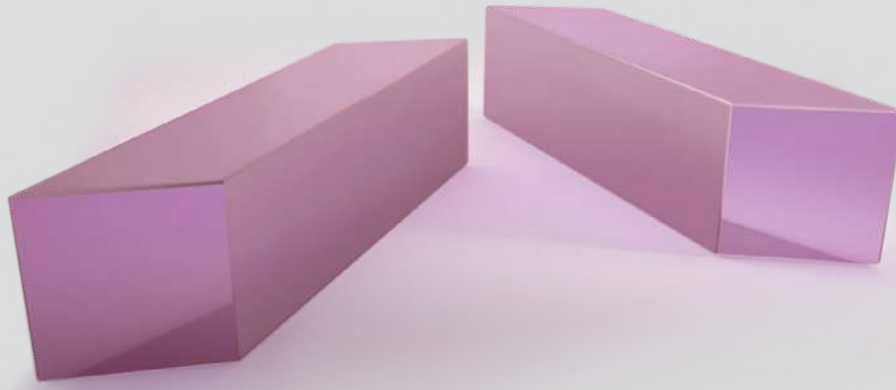
Optogama does not provide standard product list. Please contact us for solutions and pricing.

Er³⁺:KYW is a promising laser material for eye-safe emission at the wavelength of 1609 nm, which can be resonantly diode-pumped into the upper laser manifold at 1534 nm. Due to the low quantum defect high-slope efficiencies of >80% can be achieved with direct fiber laser or InGaAs/InP pumping. Because of a broad and smooth emission in the spectral range of 1570-1630 nm mode-locked "eye-safe" laser can be realized.



Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	1534 nm
Absorption cross-section at peak	$2,4 \times 10^{-20} \text{ cm}^2$
Absorption bandwidth at peak wavelength	3 nm
Laser wavelength	1609 nm
Lifetime of ⁴ I _{13/2} erbium energy level	3,1 ms
Emission cross-section @1609 nm	$0,4 \times 10^{-20} \text{ cm}^2$
Refractive index	$n_x = 2,05, n_y = 2,01, n_z = 1,97$
Crystal structure	Monoclinic
Density	6,5 g/cm ³
Mohs hardness	4-5
Thermal conductivity	-3,5 Wm ⁻¹ K ⁻¹
Typical doping level	<20 at. %



Er:YAG crystals

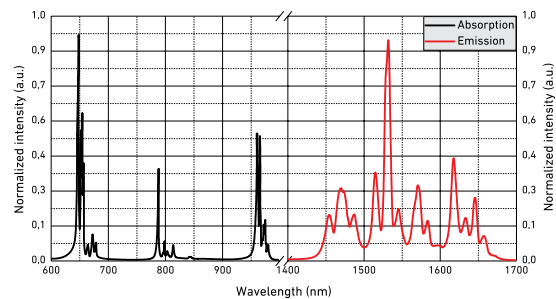
Main features

- Isotropic crystal (cubic symmetry)
- High thermal conductivity
- Strong absorption bandwidth near 1470 nm corresponding to InGaAsP/InP laser diode emission
- Emission spectra at 1617 nm is free from absorption in the atmosphere
- Custom crystals available upon request

Application examples

- CW and Q-switched eye-safe (~1,6 μm) in-band pumped lasers with nearly quantum defect limited efficiency for military applications including LIDAR, telemetry, or active imaging
- Channel waveguide eye-safe (~1,6 μm) in-band pumped lasers with diffraction-limited output for long-distance telemetry and ranging
- CW and Q-switched ~3 μm lasers for oral surgery, dentistry, implant dentistry, and otolaryngology

Er³⁺:YAG crystal is an attractive laser material for eye-safe emission at wavelengths of 1617 and 1645 nm which can be resonantly diode-pumped into the upper laser manifold at 1470 nm and 1532 nm. Due to the low quantum defect high slope efficiencies of >80% can be achieved with direct fiber laser or InGaAs/InP pumping. By using heavily erbium doped (~50 at.%) YAG crystal efficient CW laser operation at ~3 μm can be obtained.



Standard specifications

ER:YAG CRYSTALS	
Orientation	[111]
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	Uncoated, coatings available upon request
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	960, 1470, 1532 nm
Absorption cross-section at peak wavelength	~1,0 × 10 ⁻²⁰ cm ² @1470 nm
Absorption bandwidth at peak wavelength	~2-3 nm @ 1470 nm
Laser wavelength	1617, 1645, 2940 nm
Lifetime of ⁴ I _{3/2} and ⁴ I _{1/2} erbium energy level	6,0 ms (⁴ I _{3/2}), 0,1 ms (⁴ I _{1/2})
Emission cross-section at wavelength	2,6 × 10 ⁻²⁰ @2940 nm 5,2 × 10 ⁻²¹ @1645 nm
Refractive index @1064 nm	1,82
Crystal structure	Cubic
Density	4,56 g/cm ³
Mohs hardness	8,5
Thermal conductivity	~13 Wm ⁻¹ K ⁻¹
dn/dT @1064 nm	7,8 × 10 ⁻⁶ K ⁻¹
Thermal expansion coefficient	~7 × 10 ⁻⁶ K ⁻¹
Typical doping level	<1 at.% (for ~1,6 μm lasers) <50 at.% (for ~3 μm lasers)

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
5 x 5 mm	3 mm	Brewster-angle cut	0,15%	Uncoated	7852	Request
	2 mm	Brewster-angle cut	50%	Uncoated	7853	500 €

Er:YLF crystals

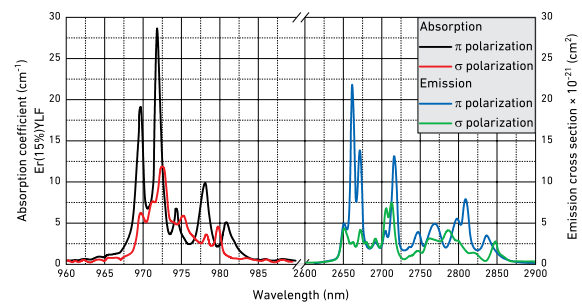
Main features

- A low phonon frequency
- Long lifetimes of the laser emitting levels
- Wide transparency range (from the VUV to the 10 μm region)
- Negative thermo-optic coefficient
- Custom crystals available upon request

Application examples

- CW and Q-switched $\sim 3 \mu\text{m}$ lasers for oral surgery, dentistry, implant dentistry, and otolaryngology
- Up-conversion visible lasers for display technology, medicine (diagnosis and treatment)

Er³⁺:YLF crystals are characterized by a low phonon frequency, which decreases the probability of non-radiative multi-phonon relaxations, therefore increases the luminescence quantum efficiency. Long lifetime of laser emitting levels allow higher energy storage, which is useful for the Q-switch lasing regime. High bandgap along with a low phonon energy leads to a very wide transparency range, which is possibly from VUV to 10 μm region. Negative Er³⁺:YLF thermo-optic coefficient is an advantage since it reduces the thermal-lensing effect and improves beam shape as well as stability at high average pump power.



Standard specifications

ER:YLF CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	Uncoated, coatings available upon request
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	972 nm
Absorption coefficient at peak wavelength	28 cm ⁻¹
Absorption bandwidth at peak wavelength	~1 nm
Laser wavelength	2810 nm
Lifetime of ⁴ F _{11/2} erbium energy level	4 ms
Emission cross-section @2800 nm	1,5 × 10 ⁻²⁰ cm ²
Refractive index @2070 nm	n _o = 1,442, n _e = 1,464
Crystal structure	tetragonal
Density	3,95 g/cm ³
Mohs hardness	5
Thermal conductivity	~5 Wm ⁻¹ K ⁻¹
dn/dT	-2 × 10 ⁻⁶ (IIa) K ⁻¹ , -4,1 × 10 ⁻⁶ (IIc) K ⁻¹
Thermal expansion coefficient	8 × 10 ⁻⁶ K ⁻¹
Typical doping level	15 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
Ø5 mm	5 mm	Brewster-angle cut	15%	Uncoated	7843	540 €
5 x 5 mm	5 mm	Brewster-angle cut	15%	Uncoated	7842	540 €



Er, Yb:phosphate glass

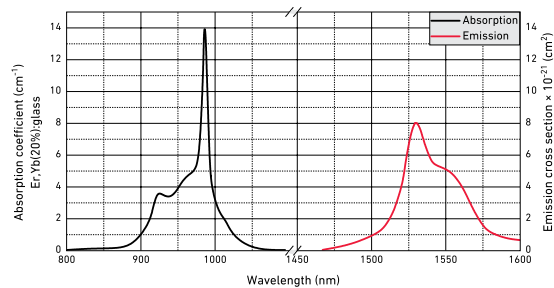
Main features

- Long lifetime of the $^4I_{13/2}$ erbium energy level
- High Yb to Er energy transfer efficiency
- High absorption and emission cross-sections
- Wide absorption and emission bandwidths
- Custom crystals available upon request

Application examples

- Passively Q-switched lasers for laser rangefinders, LIDAR, and LIBS systems

Er³⁺, Yb³⁺ co-doped phosphate glass (Er,Yb:phosphate glass) is a well-known and commonly used active medium for lasers emitting in the "eye-safe" spectral range of 1,5-1,6 μm. Phosphate glass combines a long lifetime (~8 ms) of $^4I_{13/2}$ Er³⁺ upper laser level with a low (2-3 ms) lifetime of $^4I_{11/2}$ Er³⁺ level that is in resonance with Yb³⁺ $^2F_{5/2}$ excited state. Fast non-radiative multiphonon relaxation from $^4I_{11/2}$ to $^4I_{13/2}$ level greatly decreases the back-energy transfer and up-conversion losses due to the interaction between Yb³⁺ and Er³⁺ ions, excited at the $^2F_{5/2}$ and the $^4I_{11/2}$ levels, respectively.



Standard specifications

ER, YB:PHOSPHATE GLASS ELEMENTS	
Clear aperture	>90%
Face dimensions tolerance	+0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@940 nm + AR(R<0,2%)@1535 nm on both faces
Laser induced damage threshold	>10 J/cm²@1535 nm, 10 ns
Mount	Unmounted

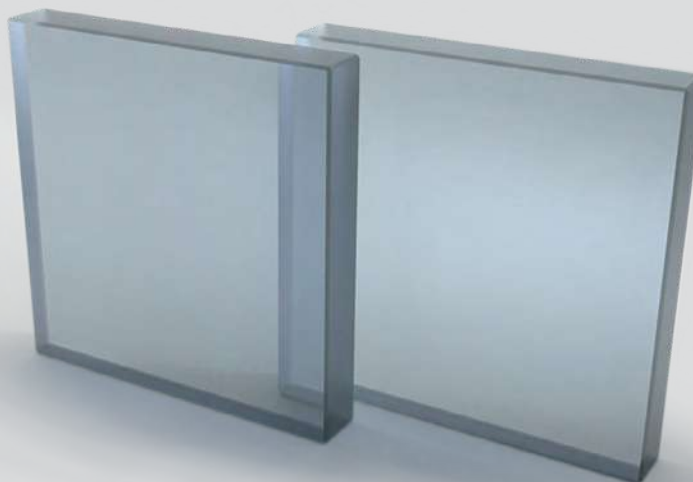
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	970 nm
Absorption cross-section at peak wavelength	$1,7 \times 10^{-20}$ cm²
Absorption bandwidth at peak wavelength	20 nm
Laser wavelength	1534 nm
Lifetime of $^4I_{13/2}$ erbium energy level	7,9 ms
Emission cross-section @1534 nm	8×10^{-21} cm²
Yb to Er energy transfer efficiency	>90 %
Refractive index @1534 nm	1,52
Crystal structure	-
Density	2,93 g/cm³
Mohs hardness	6-7
Thermal conductivity	$0,85 \text{ Wm}^{-1}\text{K}^{-1}$
dn/dT	$-2,1 \times 10^{-6} \text{ K}^{-1}$
Thermal expansion coefficient	$12,4 \times 10^{-6} \text{ K}^{-1}$
Typical doping level	$0,3-1,3 \times 10^{20} \text{ cm}^{-3}$ [Er] $1,7-4 \times 10^{21} \text{ cm}^{-3}$ [Yb]

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	5 mm	Brewster-angle cut	Yb 20%, Er 1%	Uncoated	7824	370 €
		Right-angle cut	Yb 20%, Er 1%	AR/AR@940 nm + 1535 nm	7823	435 €
	10 mm	Brewster-angle cut	Yb 20%, Er 0,5%	Uncoated	7822	370 €
		Right-angle cut	Yb 20%, Er 0,5%	AR/AR@940 nm + 1535 nm	7821	435 €

Er, Yb:YAB crystals



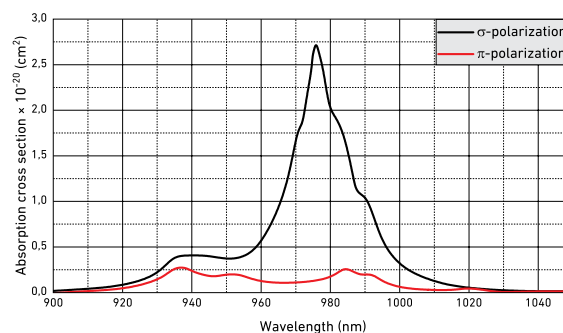
Main features

- Uniaxial crystal with trigonal structure
- High thermal conductivity
- Wide absorption bandwidth near 976 nm
- High absorption and emission cross-sections
- Extremely high Yb³⁺ to Er³⁺ energy transfer efficiency

Application examples

- High power eye-safe (~1,5 μm) CW lasers for metrology
- High-repetition rate passively Q-switched lasers for LIDAR and LIBS systems
- Ultrashort mode-locked lasers for telecom systems

Er³⁺, Yb³⁺ co-doped yttrium-aluminum borate (Er, Yb:YAB) crystal is an alternative to commonly used Er,Yb:phosphate glass as an active medium of "eye-safe" (1,5-1,6 μm) lasers with a high average output power in CW and pulsed modes. It is characterized by high thermal conductivities of 7,7 Wm⁻¹K⁻¹ and 6 Wm⁻¹K⁻¹ along a-axis and c-axis, respectively.



It also features a highly effective Yb³⁺ to Er³⁺ energy transfer (~94%) and weak up conversion losses due to the very short lifetime of ⁴I_{11/2} excited state (~80 ns) facilitated by a high maximum phonon energy of the host material (hν_{max} ~1500 cm⁻¹). A strong and wide (~17 nm) absorption band is observed at 976 nm that coincides with the emission spectrum of InGaAs laser diodes.

Standard specifications

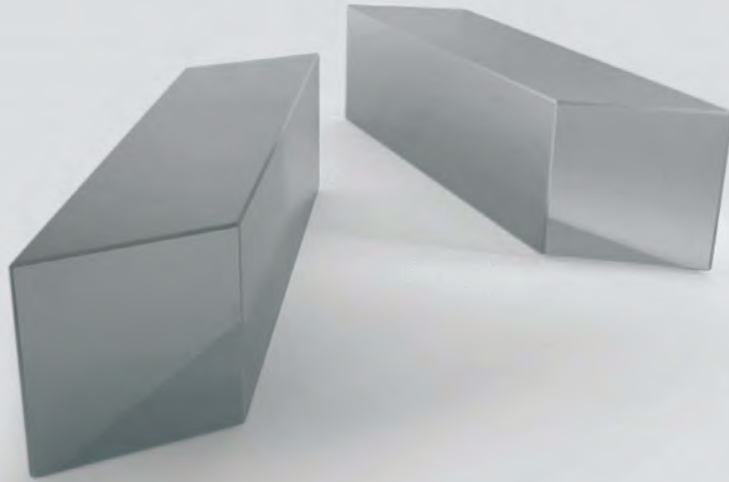
ER, YB:YAB CRYSTALS	
Orientation	c-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,15 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR@R<1%@940 nm + AR(R<0,25%)@1480-1600 nm
Laser induced damage threshold	>10 J/cm ² @1550 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	976 nm
Absorption cross-section at peak wavelength	2,7 × 10 ⁻²⁰ cm ²
Absorption bandwidth at peak wavelength	17 nm
Laser wavelength	1522, 1531, 1543, 1550, 1602 nm
Lifetime of ⁴ I _{13/2} erbium energy level	0,32 ms
Emission cross-section @1531 nm	2,5 × 10 ⁻²⁰ cm ²
Yb to Er energy transfer efficiency	>90 %
Refractive index @632.8 nm	n _o = 1,7757, n _e = 1,7015
Crystal structure	trigonal
Density	3,84 g/cm ³
Mohs hardness	7,5
Thermal conductivity	7,7 (IIa), 6 (IIc) Wm ⁻¹ K ⁻¹
dn/dT	1,4 × 10 ⁻⁴ (IIa), 4,8 × 10 ⁻⁴ (IIc) K ⁻¹
Thermal expansion coefficient	2 × 10 ⁻⁴ (IIa), 9,5 × 10 ⁻⁴ (IIc) K ⁻¹
Typical doping level	1-2 at.% [Er] 8-15 at.% [Yb]

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	1 mm	Brewster-angle cut	12% Yb, 1.5% Er	Uncoated	7068	540 €
		Right-angle cut	12% Yb, 1.5% Er	AR/AR@976 nm + 1480-1600 nm	7065	590 €
	2 mm	Brewster-angle cut	12% Yb, 1.5% Er	Uncoated	7069	540 €
		Right-angle cut	12% Yb, 1.5% Er	AR/AR@976 nm + 1480-1600 nm	7066	590 €
	3 mm	Brewster-angle cut	12% Yb, 1.5% Er	Uncoated	7070	540 €
		Right-angle cut	12% Yb, 1.5% Er	AR/AR@976 nm + 1480-1600 nm	7067	590 €



Tm:YLF crystals

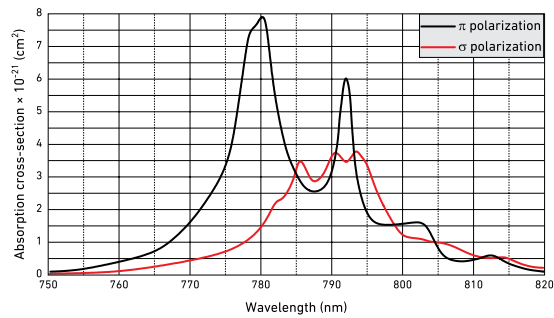
Main features

- Strong absorption bands for laser diode pumping
- Weak thermal lensing
- High polarization purity
- Custom crystals available upon request

Application examples

- LIDAR systems for remote sensing applications
- Pump source for Ho³⁺:YAG lasers

Tm³⁺:YLF crystal features high absorption peaks conveniently located for diode pumping around 792 nm and exhibits a cross-relaxation process, which creates two ions in the upper laser level for each pump photon absorbed. Tm³⁺:YLF lasers are ideal pump sources for Ho³⁺:YAG lasers. This is due to a good overlap of Tm³⁺:YLF emission and Ho³⁺:YAG absorption spectra and capacity of producing linearly polarized output. What is more, the refractive index of Tm³⁺:YLF decreases with temperature, leading to a negative thermal lens that is partly compensated by a positive lens effect due to end face bulging.



Standard specifications

TM:YLF CRYSTALS	
Orientation	a-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 5-D
Surface flatness	<λ/10@632,8 nm
Coatings	AR(R<0,5%)@792 nm + AR(R< 0,35%) @1800-1960 nm on both faces
Laser induced damage threshold	>10 J/cm ² @1900 nm, 10 ns
Mount	Unmounted

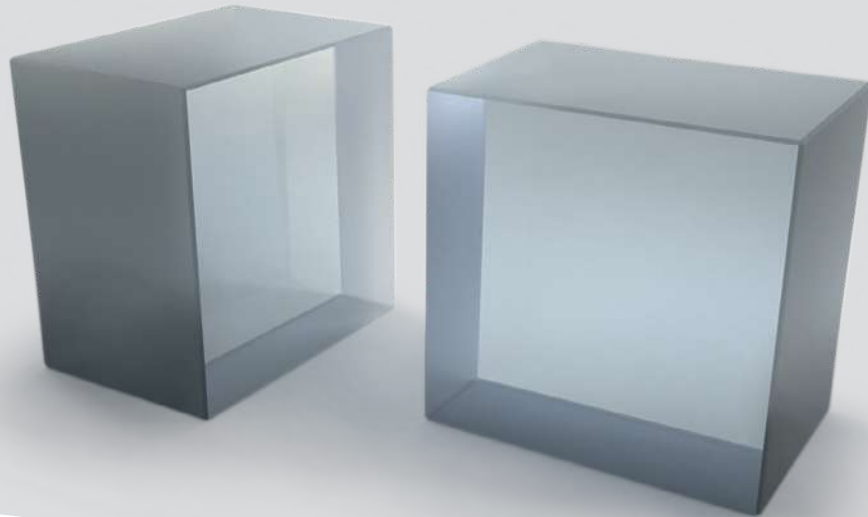
Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	792 nm
Absorption cross-section at peak	0,55 × 10 ⁻²⁰ cm ²
Absorption bandwidth at peak wavelength	16 nm
Laser wavelength	1900 nm
Lifetime of ³ F ₄ thulium energy level	16 ms
Emission cross-section @1900 nm	0,4 × 10 ⁻²⁰ cm ²
Refractive index @1064 nm	n _o = 1,448, n _e = 1,470
Crystal structure	tetragonal
Density	3,95 g/cm ³
Mohs's hardness	5
Thermal conductivity	6 Wm ⁻¹ K ⁻¹
dn/dT	-4,6 × 10 ⁻⁶ (IIc) K ⁻¹ , -6,6 × 10 ⁻⁶ (IIa) K ⁻¹
Thermal expansion coefficient	10,1 × 10 ⁻⁶ (IIc) K ⁻¹ , 14,3 × 10 ⁻⁶ (IIa) K ⁻¹
Typical doping level	2-4 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	8 mm	Brewster-angle cut	3%	Uncoated	7817	540 €
		Right-angle cut	3%	AR/AR@792 nm + 1800-1960 nm	7816	590 €

Tm:KYW crystals



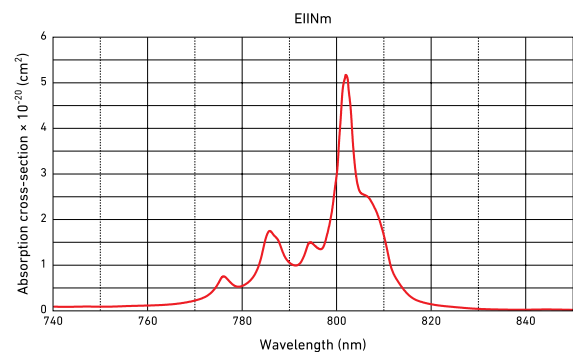
Main features

- Broad fluorescence band
- Large emission cross-section
- Relatively low upper-level lifetime
- Custom crystals available upon request

Application examples

- CW and Q-switched lasers emitting near 2 μm for application in surgery, range finding and environmental monitoring
- 2 μm wavelength region femtosecond lasers

Double tungstate crystals are optically biaxial and their optical properties have to be described within the frame of optical indicatrix axes (N_p , N_m and N_g). Advantages of Tm-doped KYW crystals include a broad fluorescence band, a large emission cross section and a relatively low upper level lifetime. Such combination of properties is very promising for generation of femtosecond pulses in solid-state laser systems.



Standard specifications

TM:KYW CRYSTALS	
Orientation	N_z -cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	$\pm 0,1$ mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	$\lambda/10 @ 632,8$ nm
Coatings	AR(R<0,5%)@802 nm + AR(R< 0,35%) @1900-2000 nm on both faces
Laser induced damage threshold	>10 J/cm ² @1900 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	802 nm
Absorption cross-section at peak	$5,2 \times 10^{-20}$ cm ²
Absorption bandwidth at peak wavelength	5,5 nm
Laser wavelength	1910 nm
Lifetime of ² F ₃ energy level	1,1 ms
Emission cross-section @1910 nm	$1,15 \times 10^{-20}$ cm ²
Refractive index @1040nm	$n_x = 2,05, n_m = 2,01, n_z = 1,97$
Crystal structure	Monoclinic
Density	6,5 g/cm ³
Mohs hardness	4-5
Thermal conductivity	$\sim 3,3$ Wm ⁻¹ K ⁻¹
dn/dT	$dn_m/dT = -9,2 \times 10^{-6}$ K ⁻¹
Thermal expansion coefficient	$\alpha_x = 1,83 \times 10^{-6}$ K ⁻¹ , $\alpha_m = 10,29 \times 10^{-6}$ K ⁻¹ , $\alpha_z = 15,94 \times 10^{-6}$ K ⁻¹
Typical doping level	~5 at. %

Standard products

FACE DIMENSIONS	LENGTH	END FACES	DOPING	COATINGS	SKU	PRICE
3 x 3 mm	2 mm	Brewster-angle cut	5%	Uncoated	7841	Request
		Right-angle cut	5%	AR/AR@802 nm +1900-2000 nm	7840	Request

Passive Q-switch crystals

Passive Q-switch crystals (saturable absorbers) are used as laser resonator quality modulators in passively Q-switched lasers instead of electrically controlled modulators. Typically, these saturable absorbers are characterized by a low saturation fluence (saturation energy per unit area) and their use with converging beams

can further reduce the saturation energy (saturation fluence times beam area). Optogama develops and supplies different passive Q-switch crystal hosts and ion dopant combinations for research and industrial applications, therefore custom solutions are available upon request.



ive it ch als



Cr:YAG crystals



V:YAG crystals



Co:Spinel crystals

Cr:YAG crystals

Main features

- Good chemical stability and reliability
- Long lifetime and good thermal conductivity
- Easy to operate
- Custom crystals available upon request

Application examples

- Passively Q-switched lasers for laser rangefinders, LIDAR and LIBS systems
- Laser systems where short pulses are required

Standard specifications

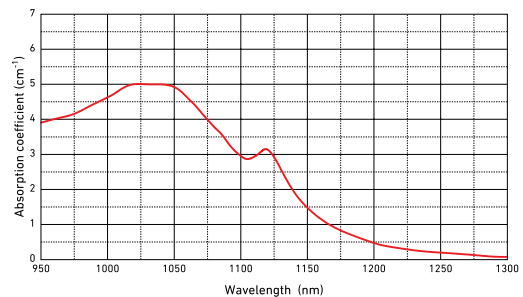
CR:YAG CRYSTALS	
Initial transmission T_0	5-99 %@1064 nm
Initial transmission T_0 tolerance	±1% (for values larger than 80 %)
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	<λ/8@632,8 nm
Wavefront distortion	<λ/4@632,8
Coatings	AR(R<0,15%)@1064 nm on both sides
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES						
Material	$\sigma_{gs}^{(1)}$ @1,064 μm	$\sigma_{gs}^{(2)}$ @1,064 μm	$\tau_{sa}^{(3)}$	Laser crystal	λ_{laser}	$\sigma_{gs}^{(1)}/\sigma_{em}^{(4)}$
Cr ³⁺ :Y ₂ Al ₂ O ₇	$46 \times 10^{-19} \text{ cm}^2$	$8,2 \times 10^{-19} \text{ cm}^2$	3,4 μs	Nd:YAG	0,946 μm	130
				Nd:YAG	1,06 μm	17
				Nd:GSAG	1,06 μm	55
				Nd:YVO ₄	1,06 μm	3,5
				Nd:GdVO ₄	1,06 μm	5
				Nd:LuVO ₄	1,06 μm	3,4
				Nd:LSB	1,06 μm	40
				Nd:YAP	1,08 μm	14
				Yb:NLM	1,01 μm	500
				Yb:YVO ₄	1,02 μm	625
				Yb:GGG	1,025 μm	250
				Yb:YAG	1,03 μm	250
				Yb:LuAG	1,03 μm	185
				Yb:KGW	1,035 μm	185

Crystal structure	Cubic
Density	4,56 g/cm ³
Thermal expansion coefficient	$6,14 \times 10^{-6} \text{ K}^{-1}$
Thermal conductivity	$11,2 \text{ Wm}^{-1}\text{K}^{-1}$
Mohs hardness	8,2
Refractive index	1,82@1064 nm

Cr³⁺:YAG crystals are ideal for passive Q-switch operation of Nd:YAG and other Nd³⁺ or Yb³⁺ doped laser crystals in the wavelength range of 900 nm to 1200 nm. Remarkable feature of Cr³⁺:YAG is the high damage threshold of >10 J/cm²@1064 nm, 10 ns. Its absorption band extends from 900 nm to 1200 nm and peaks around 1020 nm - 1070 nm with a very large absorption cross-section.



Herewith:

$\sigma_{gs}^{(1)}$ – ground-state absorption cross-section
 $\sigma_{gs}^{(2)}$ – excited-state absorption cross-section
 $\tau_{sa}^{(3)}$ – recovery time
 $\sigma_{em}^{(4)}$ – emission cross-section

Standard products

FACE DIMENSIONS	INITIAL TRANSMISSION	COATINGS	SKU	PRICE
ø3 mm	20%@1064 nm	AR/AR@1064 nm	7279	195 €
	30%@1064 nm	AR/AR@1064 nm	7280	195 €
	40%@1064 nm	AR/AR@1064 nm	7281	195 €
	50%@1064 nm	AR/AR@1064 nm	7282	195 €
	60%@1064 nm	AR/AR@1064 nm	7283	195 €
	70%@1064 nm	AR/AR@1064 nm	7284	195 €
	80%@1064 nm	AR/AR@1064 nm	7285	195 €
	85%@1064 nm	AR/AR@1064 nm	7286	195 €
	90%@1064 nm	AR/AR@1064 nm	7287	195 €
	95%@1064 nm	AR/AR@1064 nm	7288	195 €
	98%@1064 nm	AR/AR@1064 nm	7289	195 €
ø6 mm	20%@1064 nm	AR/AR@1064 nm	7301	225 €
	30%@1064 nm	AR/AR@1064 nm	7302	225 €
	40%@1064 nm	AR/AR@1064 nm	7303	225 €
	50%@1064 nm	AR/AR@1064 nm	7304	225 €
	60%@1064 nm	AR/AR@1064 nm	7305	225 €
	70%@1064 nm	AR/AR@1064 nm	7306	225 €
	80%@1064 nm	AR/AR@1064 nm	7307	225 €
	85%@1064 nm	AR/AR@1064 nm	7308	225 €
	90%@1064 nm	AR/AR@1064 nm	7309	225 €
	95%@1064 nm	AR/AR@1064 nm	7310	225 €
	98%@1064 nm	AR/AR@1064 nm	7311	225 €
3 x 3 mm	20%@1064 nm	AR/AR@1064 nm	7290	195 €
	30%@1064 nm	AR/AR@1064 nm	7291	195 €
	40%@1064 nm	AR/AR@1064 nm	7292	195 €
	50%@1064 nm	AR/AR@1064 nm	7293	195 €
	60%@1064 nm	AR/AR@1064 nm	7294	195 €
	70%@1064 nm	AR/AR@1064 nm	7295	195 €
	80%@1064 nm	AR/AR@1064 nm	7296	195 €
	85%@1064 nm	AR/AR@1064 nm	7297	195 €
	90%@1064 nm	AR/AR@1064 nm	7298	195 €
	95%@1064 nm	AR/AR@1064 nm	7299	195 €
	98%@1064 nm	AR/AR@1064 nm	7300	195 €



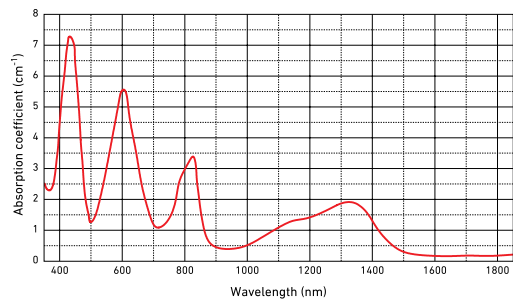
V:YAG

Main features

- High ground state absorption
- Insignificant excited state absorption
- High contrast of the Q-switch
- Good optical, mechanical, and thermal properties
- UV-resistant and features a high damage threshold
- Custom crystals available upon request

Application examples

- Passively Q-switched lasers for laser rangefinders, LIDAR and LIBS systems



Standard specifications

V:YAG CRYSTALS	
Initial transmission T_0	30-98%@1340 nm
Initial transmission T_0 tolerance	±1% (for values larger than 80%)
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	<λ/8@632,8 nm
Wavefront distortion	<λ/4@632,8
Coatings	AR(R<0,2%)@1310-1360 nm on both sides
Laser induced damage threshold	>10 J/cm²@1340 nm, 10 ns
Mount	Unmounted

V:YAG is a relatively new saturable absorber. Passive Q-switch operation is available in the spectral range from 1064 nm to 1440 nm, primarily because of an extremely high ground state. These crystals can be used with active laser media such as Nd:YAG, Nd:YAP, Nd:KGW, Nd:YVO₄ and provide good lasing characteristics in passive Q-switched lasers. V:YAG features excellent optical, mechanical, and thermal properties and can be grown by Czochralski method.

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES						
Material	$\sigma_{gsa}^{(1)}$ @1,34 μm	$\sigma_{esa}^{(2)}$ @1,34 μm	$\tau_{sa}^{(3)}$	Laser crystal	λ_{laser}	$\sigma_{gsa}^{(1)}/\sigma_{em}^{(4)}$
V ²⁺ :Y ₃ Al ₅ O ₁₃	72 × 10 ¹⁹ cm ²	7,4 × 10 ¹⁹ cm ²	5-37 ns	Pr:YAP	0,747 μm	10
				Ti:Al ₂ O ₃	0,78 μm	25
				Cr:LiCAF	0,78 μm	80
				Nd:GGG	0,93 μm	-
				Nd:YLF	1,05 μm	15
				Nd:YAG	1,06 μm	8
				Nd:YVO ₄	1,06 μm	1,5
				Yb:KYW	1,035 μm	70
				Nd:YAP	1,34 μm	24
				Nd:GdVO ₄	1,34 μm	30
				Erglass	1,54 μm	45

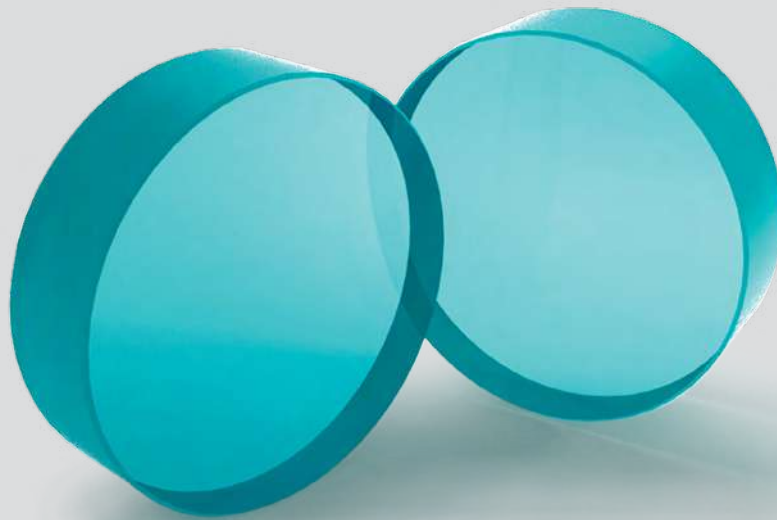
Crystal structure	Cubic
Density	4,56 g/cm ³
Thermal expansion coefficient	6,14 × 10 ⁻⁶ K ⁻¹
Thermal conductivity	11,2 Wm ⁻¹ K ⁻¹
Mohs hardness	8,2
Refractive index	1,82@1064 nm

Herewith:

- $\sigma_{gsa}^{(1)}$ – ground-state absorption cross-section
- $\sigma_{esa}^{(2)}$ – excited-state absorption cross-section
- $\tau_{sa}^{(3)}$ – recovery time
- $\sigma_{em}^{(4)}$ – emission cross-section

Standard products

FACE DIMENSIONS	INITIAL TRANSMISSION	COATINGS	SKU	PRICE
ø5 mm	30%@1340 nm	AR/AR@1310-1360 nm	7321	540 €
	40%@1340 nm	AR/AR@1310-1360 nm	7322	540 €
	50%@1340 nm	AR/AR@1310-1360 nm	7323	540 €
	60%@1340 nm	AR/AR@1310-1360 nm	7324	540 €
	70%@1340 nm	AR/AR@1310-1360 nm	7325	540 €
	80%@1340 nm	AR/AR@1310-1360 nm	7326	540 €
	85%@1340 nm	AR/AR@1310-1360 nm	7327	540 €
	90%@1340 nm	AR/AR@1310-1360 nm	7328	540 €
	95%@1340 nm	AR/AR@1310-1360 nm	7329	540 €
	3 x 3 mm	30%@1340 nm	AR/AR@1310-1360 nm	7312
40%@1340 nm		AR/AR@1310-1360 nm	7313	540 €
50%@1340 nm		AR/AR@1310-1360 nm	7314	540 €
60%@1340 nm		AR/AR@1310-1360 nm	7315	540 €
70%@1340 nm		AR/AR@1310-1360 nm	7316	540 €
80%@1340 nm		AR/AR@1310-1360 nm	7317	540 €
85%@1340 nm		AR/AR@1310-1360 nm	7318	540 €
90%@1340 nm		AR/AR@1310-1360 nm	7319	540 €
95%@1340 nm		AR/AR@1310-1360 nm	7320	540 €



Co:Spinel crystals

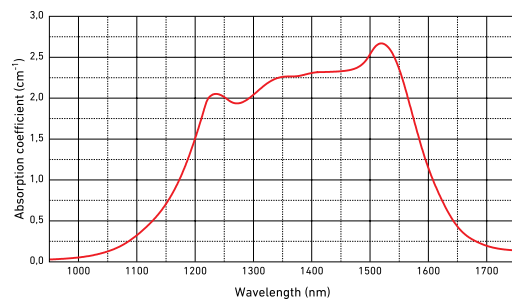
Main features

- Low optical losses in the wavelength range of 1,3 μm - 1,6 μm
- High laser induced damage threshold
- Custom crystals available upon request

Application examples

- Passive Q-switch for Er:Glass lasers @1,54 μm

Co:Spinel is a recently developed material, which has been proven to be a very effective passive Q-switch in lasers emitting in the range of 1,2 μm - 1,6 μm . Co:Spinel has a high absorption cross-section, which permits Q-switch operation of Er:glass laser (both flash-lamp and diode-laser pumped) without an intracavity focusing. Negligible excited-state absorption results in a high contrast Q-switch operation, the ratio of initial (small signal) to saturated absorption is higher than 10.



Standard specifications

CO:SPINEL CRYSTALS	
Available initial T_{90} transmission	50-99 % @1535 nm
Initial transmission T_{90} tolerance	$\pm 1\%$ (for values larger than 80%)
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/8$ @632,8 nm
Wavefront distortion	< $\lambda/4$ @632,8 nm
Coatings	AR(R<0,15%)@1535 nm
Laser induced damage threshold	>8 J/cm²@1535 nm, 10 ns
Mount	Unmounted

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES						
Material	$\sigma_{gs}^{(1)}$ @1,54 μm	$\sigma_{es}^{(2)}$ @1,54 μm	$\tau_{sa}^{(3)}$	Laser crystal	λ_{laser}	$\sigma_{gs}^{(1)}/\sigma_{em}^{(4)}$
Co ²⁺ :MgAl ₂ O ₄	$3,5 \times 10^{-19} \text{ cm}^2$	$0,1 \times 10^{-19} \text{ cm}^2$	220-350 ns	Nd:YAP	1,34 μm	1,5
				Nd:KGW	1,35 μm	4
				Nd:YAG	1,44 μm	12
				Er:glass	1,54 μm	40
Crystal structure	Cubic					
Density	3,58 g/cm ³					
Thermal expansion coefficient	$6,14 \times 10^{-6} \text{ K}^{-1}$					
Thermal conductivity	17 Wm ⁻¹ K ⁻¹					
Mohs hardness	8					
Refractive index	1,6-1,75					

Herewith:

$\sigma_{gs}^{(1)}$ – ground-state absorption cross-section

$\sigma_{es}^{(2)}$ – excited-state absorption cross-section

$\tau_{sa}^{(3)}$ – recovery time

$\sigma_{em}^{(4)}$ – emission cross-section

Standard products

FACE DIMENSIONS	INITIAL TRANSMISSION	COATINGS	SKU	PRICE
3 x 3 mm	80%@1535 nm	AR/AR@1535 nm	7331	340 €
	85%@1535 nm	AR/AR@1535 nm	7332	340 €
	90%@1535 nm	AR/AR@1535 nm	7333	340 €
	92%@1535 nm	AR/AR@1535 nm	7334	340 €
	95%@1535 nm	AR/AR@1535 nm	7335	340 €
	97%@1535 nm	AR/AR@1535 nm	7336	340 €
5 x 5 mm	80%@1535 nm	AR/AR@1535 nm	7338	390 €
	85%@1535 nm	AR/AR@1535 nm	7339	390 €
	90%@1535 nm	AR/AR@1535 nm	7340	390 €
	92%@1535 nm	AR/AR@1535 nm	7341	390 €
	95%@1535 nm	AR/AR@1535 nm	7342	390 €
	97%@1535 nm	AR/AR@1535 nm	7343	390 €



Nonlinear optical crystals are used in many different nonlinear parametric applications. To mention a few: second harmonic generation, difference frequency generation, optical parametric amplification and others. A proper crystal has to be chosen in order to use it for a particular application. It should have transparency in the required spectral range, adequate birefringence for phase-matching, a high nonlinear co-

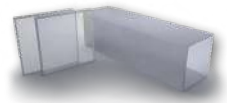
efficient, high optical damage threshold, and other properties. Contact Optogama team for assistance and custom solutions. Optogama develops and supplies different nonlinear crystals for fundamental, applied research and industrial applications. Available crystal growth techniques: Stepanov, Kyropoulos, Czochralski (CZ), temperature gradient technique (TGT), flux method.

Nonlinear crystals

near als



BBO crystals



LBO crystals



KTP crystals



KDP, DKDP crystals



Lithium niobate crystals



AgGaSe₂ crystals



AgGaS₂ crystals



ZnGeP₂ crystals



CdSe crystals



GaSe crystals

BBO crystals



Main features

- Broad transparency range from 188 nm to 5,2 μm (reasonable transparency @3 μm - 5,2 μm for few tens μm thick crystals)
- Broad phase-matchable range for various second order nonlinear interactions over almost the entire transparency range
- Wide thermal acceptance bandwidth
- Highest nonlinearity of all UV nonlinear crystals
- High laser induced damage threshold
- Ultrathin crystals available for few optical cycle laser pulses
- Custom size, orientation and coatings are available upon request

Application examples

- Harmonic generation (up to fifth) of pulsed Nd-doped crystal based lasers
- Frequency doubling, tripling of pulsed Ti:Sapphire, Yb-doped, dye lasers
- Widely tunable type I and II OPO
- Characterization of ultrashort laser pulses by FROG, XFROG, SPIDER, dispersion scan, chirp scan methods

BBO crystal transparency ranges from 188 nm to 5,2 μm, which includes reasonable transparency from 3 μm - 5,2 μm for few tens μm thick crystals, while their phase-matchable range spans almost over the entire transparency range. Combined with other magnificent properties of BBO, it is favorable for numerous nonlinear parametric applications, e.g. harmonic generation of pulsed Yb-doped crystal based lasers and frequency doubling, tripling of Ti:Sapphire lasers, widely tunable type I and II OPO. It is worth to mention that BBO crystals have the highest nonlinearity in the UV range out of all common nonlinear crystals.

Standard specifications

BBO CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<5 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Wavefront distortion	<λ/8@632,8 nm
Coatings	Low dispersion protective coatings or antireflective coatings on both sides
Laser induced damage threshold	>500 MW/cm ² @1064 nm, 10 ns
UVFS support	Crystals with <0,1 mm thickness are optically contacted to 0,5-1 mm UVFS support
Mount	Mounted in ø25,4 mm black or natural aluminum mount

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	β-BaB ₂ O ₆
Crystal structure	Rhombohedral, 3m
Lattice parameters	a=12,532 Å, c=12,717 Å
Optical symmetry	Negative uniaxial (n _o >n _e)
Density	3,85 g/cm ³
Mohs hardness	4-4,5
Transparency range	188 nm - 5,2 μm, reasonable from 3 μm to 5,2 μm for thin crystals (few tens of μm)
Sellmeier equations @188 nm - 5,2 μm range (λ in μm)	$n_o^2 = 1 + 0,90291 \lambda^2 / (\lambda^2 - 0,003926) + 0,83155 \lambda^2 / (\lambda^2 - 0,018786) + 0,76536 \lambda^2 / (\lambda^2 - 60,01)$ $n_e^2 = 1 + 1,151075 \lambda^2 / (\lambda^2 - 0,007142) + 0,21803 \lambda^2 / (\lambda^2 - 0,02259) + 0,656 \lambda^2 / (\lambda^2 - 263)$
Refractive indices	n _o = 1,6551, n _e = 1,5426 @1064 nm

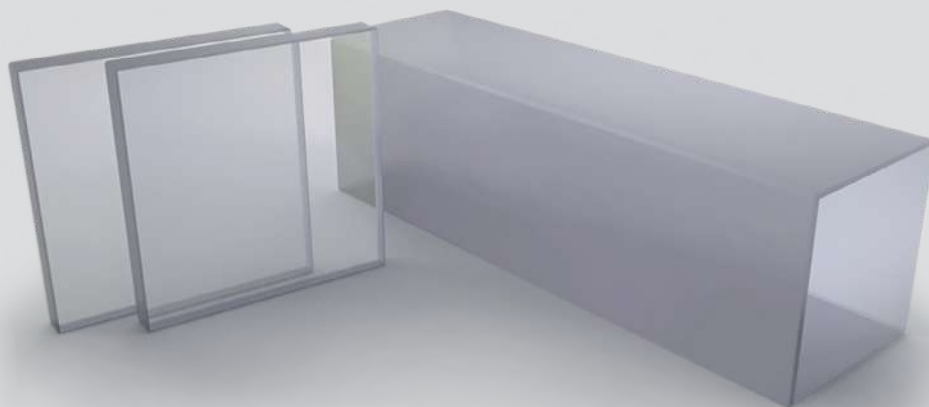
Guidance

Optogama provide guidance and theoretical calculations for particular BBO applications. Contact us and we will help you to configure your crystal.

Standard products

FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
6 x 6 mm	0,1 mm	50°	90°	P/P@515/257 nm	SHG@515 nm, 50 fs, type I	15808	520 €
	0,15 mm	50°	90°	P/P@515/257 nm	SHG@515 nm, 100 fs, type I	15809	500 €
	0,3 mm	50°	90°	P/P@515/257 nm	SHG@515 nm, 200 fs, type I	15810	480 €
	0,05 mm	29,2°	90°	P/P@400-800 nm	SHG@800 nm, 10 fs, type I	15811	620 €
	0,1 mm	29,2°	90°	P/P@400-800 nm	SHG@800 nm, 20 fs, type I	6399	450€
	0,2 mm	29,2°	90°	P/P@400-800 nm	SHG@800 nm, 50 fs, type I	15833	440 €
	0,5 mm	29,2°	90°	P/P@400-800 nm	SHG@800 nm, 100 fs, type I	6398	420 €
	1 mm	29,2°	90°	P/P@400-800 nm	SHG@800 nm, 200 fs, type I	6400	370 €
	0,5 mm	23,4°	90°	AR/AR@515+1030 nm	SHG@1030 nm, 50 fs, type I	9447	440 €
	1 mm	23,4°	90°	AR/AR@515+1030 nm	SHG@1030 nm, 100 fs, type I	9448	400 €
	1,5 mm	23,4°	90°	AR/AR@515+1030 nm	SHG@1030 nm, 150 fs, type I	9449	430 €
	2 mm	23,4°	90°	AR/AR@515+1030 nm	SHG@1030 nm, 200 fs, type I	10733	430 €
	0,01 mm	44,3°	90°	P/P@400-800/266 nm	THG@800 nm, 10 fs, type I	15834	700 €
	0,02 mm	44,3°	90°	P/P@400-800/266 nm	THG@800 nm, 20 fs, type I	15835	670 €
	0,05 mm	44,3°	90°	P/P@400-800/266 nm	THG@800 nm, 50 fs, type I	15836	620 €
	0,1 mm	44,3°	90°	P/P@400-800/266 nm	THG@800 nm, 100 fs, type I	9044	450 €
	0,2 mm	44,3°	90°	P/P@400-800/266 nm	THG@800 nm, 200 fs, type I	15837	440 €
	0,15 mm	32,5°	90°	AR/AR@515+1030/343 nm	THG@1030 nm, 50 fs, type I	9450	650 €
	0,25 mm	32,5°	90°	AR/AR@515+1030/343 nm	THG@1030 nm, 100 fs, type I	9451	580 €
	0,55 mm	32,5°	90°	AR/AR@515+1030/343 nm	THG@1030 nm, 200 fs, type I	9452	490 €

LBO crystals



Main features

- Broad transparency range from 155 nm to 3200 nm
- Absence of photochromic damage (gray-tracking)
- Highest damage threshold among common nonlinear crystals
- Small walk-off angle at room temperature, no walk-off at NCPM regime
- Wide acceptance angle
- Temperature tunable type I and II non-critical phase-matching
- Custom size, orientation and coatings are available upon

Application examples

- Sum-frequency generation of 532 nm and 1064 nm to produce 355 nm UV radiation
- Widely tunable OPOs in NIR range pumped by second harmonic of Nd-doped lasers
- Efficient second harmonic generation at 1064 nm without walk-off effect (NCPM, $t = 149^\circ\text{C}$)

Lithium Triborate (LiB₃O₅, LBO) crystals feature a broad transparency range, wide acceptance angle, small walk-off angle and the highest damage threshold among common nonlinear crystals. Most common applications include high-power near-infrared wavelength second harmonic generation, sum frequency generation to produce visible, ultraviolet laser light and visible, near-infrared widely tuned optical parametric oscillators.

Standard specifications

LBO CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Wavefront distortion	<N/4@632,8 nm
Coatings	AR coatings on both sides
Laser induced damage threshold	>1 GW/cm ² @1064 nm, 10 ns
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	LiB ₃ O ₅
Crystal structure	Orthorhombic, mm ²
Lattice parameters	a = 8,46 Å, b = 7,38 Å, c = 12,717 Å
Optical symmetry	Negative biaxial (2V _z = 109,2° @0,5321 μm)
Density	2,474 g/cm ³
Mohs hardness	6-7
Transparency range	155 nm - 3,2 μm @0° transmittance level
Sellmeier equations @T = 293 K (λ in μm)	$n_x^2 = 2,4542 + 0,01125/(\lambda^2 - 0,01135) - 0,01388 \lambda^2$ $n_y^2 = 2,5390 + 0,01277/(\lambda^2 - 0,01189) - 0,01849 \lambda^2$ $+ 4,3025 \times 10^{-5} \lambda^4 - 2,9131 \times 10^{-5} \lambda^6$ $n_z^2 = 2,5865 + 0,0131/(\lambda^2 - 0,01223) - 0,01862 \lambda^2 + 4,5778 \times 10^{-5} \lambda^4 - 3,2526 \times 10^{-5} \lambda^6$
Refractive indices	$n_x = 1,5656$; $n_y = 1,5905$; $n_z = 1,6055$ @1064 nm

Guidance

Optogama provides guidance and theoretical calculations for particular LBO applications. Contact us and we will help you to configure your crystal.

Standard products

FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
3 x 3 mm	10 mm	90°	11,6°	AR/AR@532+1064 nm	SHG@1064 nm, type I	7203	230 €
	10 mm	42,2°	90°	AR/AR@532+1064/355 nm	THG@1064 nm, type II	7199	230 €
	10 mm	90°	0°	AR/AR@532+1064 nm	NCPM SHG@1064 nm, T = 149 °C	7209	230 €
	20 mm	90°	11,6°	AR/AR@532+1064 nm	SHG@1064 nm, type I	7202	380 €
	20 mm	42,2°	90°	AR/AR@532+1064/355 nm	THG@1064 nm, type II	9457	380 €
	20 mm	90°	0°	AR/AR@532+1064 nm	NCPM SHG@1064 nm, T = 149 °C	7210	380 €
5 x 5 mm	10 mm	90°	11,6°	AR/AR@532+1064 nm	SHG@1064 nm, type I	7207	600 €
	10 mm	42,2°	90°	AR/AR@532+1064/355 nm	THG@1064 nm, type II	7204	600 €
	20 mm	90°	11,6°	AR/AR@532+1064 nm	SHG@1064 nm, type I	7208	850 €
	20 mm	42,2°	90°	AR/AR@532+1064/355 nm	THG@1064 nm, type II	9459	850 €
6 x 6 mm	1 mm	90°	13,8°	AR/AR@515+1030 nm	SHG@1030 nm, type I	9458	430 €
	2 mm	90°	13,8°	AR/AR@515+1030 nm	SHG@1030 nm, type I	9460	420 €
	3 mm	90°	13,8°	AR/AR@515+1030 nm	SHG@1030 nm, type I	9461	450 €
	4 mm	90°	13,8°	AR/AR@515+1030 nm	SHG@1030 nm, type I	9462	500 €

KTP crystals

Main features

- High nonlinearity
- Nonhygroscopic crystal
- Great mechanical stability
- Wide transparency range from 350 nm to 4,5 μm
- Broad angular and thermal acceptance
- Broad type I and II non-critical phase-matching range

Application examples

- Low and medium power frequency doubling of Nd-doped lasers
- KTP OPO and ZGP OPO tandem for mid-infrared generation

Potassium titanyl phosphate (KTiOPO_4 , KTP) crystals are advantageous due to their high nonlinearity, great mechanical stability, high optical quality and transparency range of 350 nm - 4,5 μm . These features determine the wide application of KTP crystals as a nonlinear medium.

It is an excellent solution for frequency doubling applications of Nd-doped lasers, especially for low and medium power applications, both intra- and extra-cavity design.

Besides, these crystals can be used as a nonlinear OPO medium for IR generation up to 4 μm and used as a pump source for mid-IR nonlinear crystal based optical parametric oscillators, such as ZGP OPO. KTP is susceptible to photochromic damage (grey-tracking), which causes deterioration of nonlinear conversion efficiency. Optogama provide high grey track resistance (HGTR) KTP crystals as a solution, which significantly improves the grey-track resistance and overall performance. HGTR KTP crystals extend the use of KTP as a nonlinear medium to high-power applications.

Please request in case you need HGTR KTP crystals for your applications.

Standard specifications

KTP CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	$\pm 0,1$ mm
Parallelism error	<20 arcsec
Perpendicularity error	<5 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Wavefront distortion	< $\lambda/8$ @632,8 nm
Coatings	AR(R<0,25%)532+1064 nm on both faces
Laser induced damage threshold	>500 MW/cm ² @1064 nm, 10 ns
Mount	Unmounted

Properties

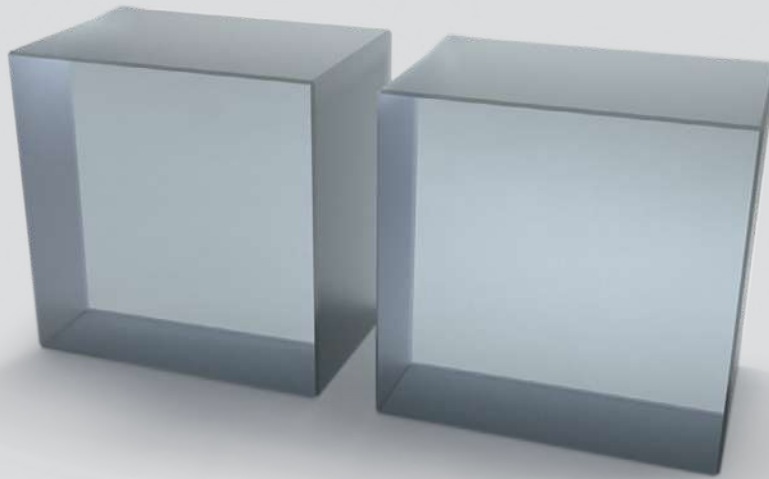
PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	KTiOPO_4
Crystal structure	Orthorhombic, mm ²
Lattice parameters	a = 12,814 Å, b = 6,404 Å, c = 10,616 Å
Optical symmetry	Positive biaxial ($2V_x = 37,4^\circ$ @0,5461 μm)
Density	2,945 g/cm ³
Mohs hardness	5
Transparency range	350 nm - 4,5 μm @"0" transmittance level
Sellmeier equations (λ in μm)	$n_x^2 = 3,0067 + 0,0395/\lambda^2 - 0,04251$ - 0,01247 λ^2 ; $n_y^2 = 3,0319 + 0,04152/\lambda^2 - 0,04586$ - 0,01337 λ^2 ; $n_z^2 = 3,3134 + 0,05694/\lambda^2 - 0,05941$ - 0,016713 λ^2
Refractive indices	$n_x = 1,7404$; $n_y = 1,7479$; $n_z = 1,8296$ @1064 nm

Guidance

Optogama provide guidance and theoretical calculations for particular KTP applications. Contact us and we will help you to configure your crystal.

Standard products

FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
3 x 3 mm	5 mm	90°	23,5°	AR/AR@532+1064 nm	SHG@1064 nm, type II	7184	110 €
	10 mm	90°	23,5°	AR/AR@532+1064 nm	SHG@1064 nm, type II	7188	160 €
5 x 5 mm	5 mm	90°	23,5°	AR/AR@532+1064 nm	SHG@1064 nm, type II	7189	240 €
	10 mm	90°	23,5°	AR/AR@532+1064 nm	SHG@1064 nm, type II	7193	290 €
7 x 7 mm	5 mm	90°	23,5°	AR/AR@532+1064 nm	SHG@1064 nm, type II	7194	350 €
	10 mm	90°	23,5°	AR/AR@532+1064 nm	SHG@1064 nm, type II	7198	500 €



KDP, DKDP crystals

Main features

- Excellent ultraviolet radiation transmission
- High laser induced damage threshold
- Custom crystals available upon request

Application examples

- Frequency doublers, triplers and quadruplers for Nd-doped lasers
- Q-switches for Ti:Sapphire, Alexandrite, Nd-doped lasers

Potassium dihydrogen phosphate (KH_2PO_4 , KDP) and potassium dideuterium phosphate (KD_2PO_4 , DKDP) crystals are one of the oldest used nonlinear materials. DKDP and KDP are known as analogs, though their properties differ due to DKDP deuteration. They both exhibit excellent ultraviolet transmission and high damage threshold. The nonlinearity of these crystals is relatively low, but these crystals can be grown in large size. They found their application as nonlinear frequency doublers, triplers and quadruplers of Nd-doped lasers and as Q-switch devices for Ti:Sapphire, Alexandrite, Nd-doped lasers. Main drawback is that these crystals are highly hygroscopic, therefore sealed housing and dry operating conditions must be ensured.

Standard specifications

KDP, DKDP CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	±0,1 mm
Parallelism error	<20 arcsec
Perpendicularity error	<5 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/4@632,8 nm
Coatings	AR coatings on both sides
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns for KDP crystals >5 J/cm ² @1064 nm, 10 ns for DKDP
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES		
Chemical formula	KH_2PO_4 (KDP)	KD_2PO_4 (DKDP)
Crystal structure	Tetragonal, 42m	Tetragonal, 42m
Lattice parameters	a = 7,448 Å, c = 6,977 Å	a = 7,4697 Å, c = 6,966 Å
Optical symmetry	Negative uniaxial (n _o > n _e)	Negative uniaxial (n _o > n _e)
Density	2,332 g/cm ³	2,355 g/cm ³
Mohs hardness	2,5	2,5
Transparency range	180 nm - 1,5 μm	200 nm - 2 μm
Refractive indices	n _o = 1,4938, n _e = 1,4599 @1,06 μm	n _o = 1,4931; n _e = 1,4582 @1,06 μm
KDP Sellmeier equations @T = 293 K (λ in μm)	$n_o^2 = 2,259276 + 13,00522 \lambda^2 / (\lambda^2 - 400) + 0,01008956 / (\lambda^2 - (77,26408)^2)$ $n_e^2 = 2,132668 + 3,2279924 \lambda^2 / (\lambda^2 - 400) + 0,008637494 / (\lambda^2 - (81,42631)^2)$	
DKDP Sellmeier equations @T = 293 K (λ in μm)	$n_o^2 = 2,240921 + 2,246956 \lambda^2 / (\lambda^2 - (11,26591)^2) + 0,009676 / (\lambda^2 - (0,124981)^2)$ $n_e^2 = 2,126019 + 0,784404 \lambda^2 / (\lambda^2 - (11,10871)^2) + 0,008578 / (\lambda^2 - (0,109505)^2)$	

Guidance

Optogama provide guidance and theoretical calculations for particular KDP and DKDP applications. Contact us and we will help you to configure your crystal.

Standard products

MATERIAL	FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
KDP	12 x 12 mm	5 mm	76,5°	45°	AR/AR@532/266 nm	SHG@532 nm, type I	9421	470 €
	15 x 15 mm	7 mm	76,5°	45°	AR/AR@532/266 nm	SHG@532 nm, type I	9422	490 €
	12 x 12 mm	20 mm	53,5°	0°	AR/AR@1064/532+1064 nm	SHG@1064 nm, type II	9426	750 €
	12 x 12 mm	20 mm	59,3°	0°	AR/AR@1064/532+1064 nm	THG@1064 nm, type II	9425	750 €
DKDP	15 x 15 mm	13 mm	36,5°	45°	AR/AR@532+1064 nm	SHG@1064 nm, type I	9423	800 €
	15 x 15 mm	13 mm	53,5°	0°	AR/AR@532+1064 nm	SHG@1064 nm, type II	9424	800 €
	15 x 15 mm	20 mm	53,5°	0°	AR/AR@1064/532+1064 nm	SHG@1064 nm, type II	9427	870 €
	15 x 15 mm	20 mm	59,3°	0°	AR/AR@532+1064/355 nm	THG@1064 nm, type II	9428	870 €



Lithium niobate crystals

Main features

- Broad transparency region from 420 nm to 5200 nm
- High nonlinear, electro-optic and acousto-optic coefficients
- Nonhygroscopic, mechanically, and chemically stable

Application examples

- Electro-optic modulation and Q-switching
- Optical parametric oscillators (OPO) pumped at 1064 nm
- Quasi-phase-matched devices with periodically poled lithium niobate (PPLN)

Optogama does not provide standard product list. Please contact us for solutions and pricing.

Lithium niobate (LiNbO_3 , LN) is a multi-purpose material in photonics and optoelectronics fields. It features a wide transparency range from 420 nm to 5,2 μm , excellent nonlinear, electro-optic, and piezoelectric properties. Most common applications include infrared range optical modulation and Q-switching, nonlinear frequency conversion of $>1 \mu\text{m}$ wavelengths. Their electrical and optical properties can be adjusted using magnesium or zirconium dopants.

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	LiNbO_3
Crystal structure	Trigonal, 3m
Optical symmetry	Negative uniaxial ($n_o > n_e$)
Density	4,64 g/cm ³
Mohs hardness	5
Transparency range	420 nm - 5,2 μm
Sellmeier equations (λ in μm)	$n_o^2 = 4,9048 + 0,11768/\lambda^2 - 0,04750 - 0,027169 \lambda^2$ $n_e^2 = 4,5820 + 0,099169/\lambda^2 - 0,04443 - 0,021950 \lambda^2$
Refractive indices	$n_o = 2,220$; $n_e = 2,146$ @1064 nm



CdSe crystals

Main features

- Wide transparency range (0,7-24 μm)
- Reasonably large nonlinearity
- Small walk-off angle

Application examples

- Far infrared wavelength radiation generation by DFG, OPO methods
- Material for infrared optical elements: substrates, polarizers, waveplates, etc.

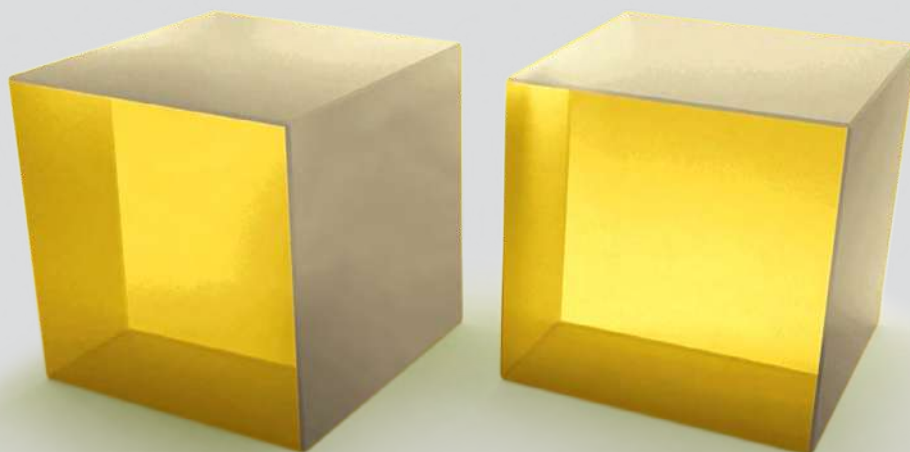
Optogama does not provide standard product list. Please contact us for solutions and pricing.

Cadmium selenide (CdSe) crystals feature an infrared transmission up to 24 μm , reasonably large nonlinearity and small walk-off angle. CdSe crystals can be employed into difference frequency generation (DFG), optical parametric oscillation (OPO) schemes to generate infrared laser radiation above ZGP absorption edge ($>12 \mu\text{m}$). For instance, CdSe OPO can potentially be pumped by 2 μm Tm-doped, Ho-doped, Tm and Ho co-doped lasers and produce far infrared idler radiation. Besides nonlinear optic applications cadmium selenide crystal material can be used for IR optical elements: substrates, polarizers, waveplates and other.

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	CdSe
Crystal structure	Hexagonal, 6mm
Lattice parameters	$a = 4,2985 \text{ \AA}$, $c = 7,0150 \text{ \AA}$
Optical symmetry	Positive uniaxial ($n_e > n_o$)
Density@288 K	5,81 g/cm ³
Mohs hardness	3,25
Transparency range	0,7-24 μm @ "0" transmittance level)
Dispersion equations @T = 293 K (λ in μm)	$n_o^2 = 4,2243 + 1,7680 \lambda^2 / (\lambda^2 - 0,2270) + 3,1200 \lambda^2 / (\lambda^2 - 3380)$; $n_e^2 = 4,2009 + 1,8875 \lambda^2 / (\lambda^2 - 0,2171) + 3,6461 \lambda^2 / (\lambda^2 - 3629)$
Refractive indices	$n_o = 2,431$, $n_e = 2,452 @ 10,0 \mu\text{m}$
Thermal conductivity @T = 293 K	6,9 (llc) Wm ⁻¹ K ⁻¹ , 6,2 (Lc) Wm ⁻¹ K ⁻¹
Laser induced damage threshold	60 MW/cm ² @10,6 μm , 200 ns

AgGaS₂ crystals



Main features

- Unique non-linear properties across the transmission range from 0,5 μm to 12 μm
- Low optical absorption and scattering
- Transparency at short wavelengths

Application examples

- Frequency mixing in the middle IR region up to ~12 μm
- Second harmonic generation and up-conversion for CO₂ lasers
- Tunable OPO for solid-state lasers

Silver Thiogallate (AgGaS₂, AGS) has been demonstrated as an efficient crystal for nonlinear parametric applications in the infrared spectral range. Its transparency region spans from 0,53 μm to 12 μm. AGS based optical parametric oscillators feature continuously tunable radiation over a wide range of wavelengths in the infrared spectral range. High transparency in the short wavelength range beginning at 550 nm is used in OPOs pumped by Nd:YAG laser.

Using 2050 nm pump laser, an optimally designed AgGaS₂ OPO is tunable from about 2.5 to 12.0 μm. The output range can be extended by the sum or difference frequency mixing (SFM/DFM). AGS crystal features high non-linear coefficient, high damage threshold, low optical absorption and scattering.

Standard specifications

AgGaS ₂ CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>80%
Face dimensions tolerance	+0,0/-0,2 mm
Parallelism error	<30 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,2 mm at 45°
Surface quality	60-40 S-D
Coatings	BBAR/BBAR@1,2-2,6 μm/2,6-11 μm
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	AgGaS ₂
Crystal structure	Tetragonal, 42m
Lattice parameters	a = 5,742 Å, c = 10,26 Å
Optical symmetry	Negative uniaxial (n _x > n _y , λ < 0,497 μm n _z > n _y)
Density	4,58 g/cm ³
Mohs hardness	3-3,5
Transparency range	0,47 - 13 μm @ "0" transmittance level
Sellmeier equations @ T = 293 K (λ in μm)	n _x ² = 5,79419 + 0,23114/(λ ² - 0,06882) - 2,4534 × 10 ⁻³ λ ² + 3,1814 × 10 ⁻⁷ λ ⁴ - 9,7051 × 10 ⁻⁹ λ ⁶ ; n _y ² = 5,54120 + 0,22041/(λ ² - 0,09824) - 2,5240 × 10 ⁻³ λ ² + 3,6214 × 10 ⁻⁷ λ ⁴ - 8,3605 × 10 ⁻⁹ λ ⁶
Refractive indices	n _x = 2,3471; n _y = 2,2914 @ 10,6321 μm
Thermal conductivity	1,4 (llc) Wm ⁻¹ K ⁻¹ , 1,5 (Lc) Wm ⁻¹ K ⁻¹

Guidance

Optogama provides guidance and theoretical calculations for particular AgGaS₂ applications. Contact us and we will help you to configure your crystal.

Standard products

FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
5 x 5 mm	1 mm	39°	45°	BBAR/BBAR@1,2-2,6/2,6-11 μm	DFG@1,2-2,6 μm, type I	7356	Request
8 x 8 mm	1 mm	39°	45°	BBAR/BBAR@1,2-2,6/2,6-11 μm	DFG@1,2-2,6 μm, type I	7395	Request
6 x 6 mm	2 mm	50°	0°	BBAR/BBAR@1,2-2,6/2,6-11 μm	DFG@1,2-2,6 μm, type II	7396	Request
8 x 8 mm	2 mm	50°	0°	BBAR/BBAR@1,2-2,6/2,6-11 μm	DFG@1,2-2,6 μm, type II	7397	Request



AgGaSe₂ crystals

Main features

- Excellent properties across the transmission range from 0,73 to 18 μm
- Low optical absorption and scattering
- High FOM (figure of merit) for non-linear interactions in NIR and MIR

Application examples

- Frequency mixing in the IR region $\sim 18,3 \mu\text{m}$
- Second harmonic generation and up-conversion for CO₂ lasers
- Tunable OPO for solid-state lasers

Silver gallium selenide (AgGaSe₂, AGSe) is an optically negative uniaxial crystal with a reasonable transmittance over $\sim 0,7 \mu\text{m} - 18 \mu\text{m}$ region. AGSe crystals have proven to be used in nonlinear parametric downconversion (difference frequency generation, DFG) in the Mid-IR range by tandem with commercially available synchronously-pumped optical parametric oscillators (SPOPOs) in the femtosecond and picosecond regime. AGSe crystal has high figure of merit ($\sim 70 \text{ pm}^2/\text{V}^2$, $n \sim 2,6$), which is six times larger than counterpart AGS. For some reasons AGSe is also a better choice over other mid-IR crystals. For example, even though GaSe has higher nonlinearity and comparable transparency region, AGSe has lower spatial walk-off and availability to be processed for particular application (growth and cut direction, dielectric thin-film coatings). ZGP has higher figure of merit, but its transparency region ($\sim 2-12 \mu\text{m}$) is no match to AGSe.

Standard specifications

AgGaSe ₂ CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>80%
Face dimensions tolerance	+0,0/-0,2 mm
Parallelism error	<30 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,2 mm at 45°
Surface quality	60-40 S-D
Coatings	BBAR/BBAR@1,7-2,7 μm /5-18 μm
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	AgGaSe ₂
Crystal structure	Tetragonal, 42m
Lattice parameters	a = 5,9920 Å, c = 10,8803 Å
Optical symmetry	Negative uniaxial ($n_o > n_e$, $\lambda < 804 \text{ nm}$, $n_o > n_e$)
Density	5,7 g/cm ³
Mohs hardness	3-3,5
Transparency range	0,71 - 19 μm @'0' transmittance level
Sellmeier equations @T=293 K (λ in μm)	$n_o^2 = 6,8507 + 0,4297/(\lambda^2 - 0,1584) - 0,00125 \lambda^2$ $n_e^2 = 6,6792 + 0,4598/(\lambda^2 - 0,2122) - 0,00126 \lambda^2$
Refractive indices	$n_o = 2,5917$; $n_e = 2,5585$ @10,5 μm
Thermal conductivity @T = 293 K	1 (llc) Wm ⁻¹ K ⁻¹ , 1,1 (Lc) Wm ⁻¹ K ⁻¹
Laser induced damage threshold	>10 MW/cm ² @10,6 μm , 150 ns

Guidance

Optogama provides guidance and theoretical calculations for particular AgGaSe₂ applications. Contact us and we will help you to configure your crystal.

Standard products

FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
5 x 5 mm	2 mm	52°	45°	BBAR@1,7-2,7 μm /BBAR@5-18 μm	Ultrashort pulse DFG@1,7-2,7 μm -> $\sim 5-18 \mu\text{m}$, type I	15806	Request
	5 mm	52°	45°	BBAR@1,7-2,7 μm /BBAR@5-18 μm	Ultrashort pulse DFG@1,7-2,7 μm -> $\sim 5-18 \mu\text{m}$, type I	15807	Request
	10 mm	52°	45°	BBAR@1,7-2,7 μm /BBAR@5-18 μm	Ultrashort pulse DFG@1,7-2,7 μm -> $\sim 5-18 \mu\text{m}$, type I	15805	Request

ZnGeP₂ crystals



Main features

- The transmission range spans from 0,74 μm to 12 μm
- High nonlinearity (75 pm/V)
- High thermal conductivity (35 W/mK)
- Nominal absorption coefficient <0,04 cm⁻¹ at ~2,1 μm for o-wave

Application examples

- Mid-IR OPOs pumped at ~2,1 μm
- Generation of terahertz range frequencies

Zinc Germanium Phosphide (ZnGeP₂, ZGP) crystals feature a combination of high nonlinearity, high thermal conductivity and a wide transmission range from 0,74 to 12 μm. These crystals gained credit for their role of ~2,1 μm pumped optical parametric oscillators (OPOs) spanning the spectral range from 2 to 8 μm.

Standard specifications

ZnGeP ₂ CRYSTALS	
Orientation accuracy	<30 arcmin
Clear aperture	>80%
Face dimensions tolerance	+0,0/-0,2 mm
Length tolerance	+1,0/-0,0 mm
Parallelism error	<30 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,2 mm at 45°
Surface quality	60-40 S-D
Surface flatness	λ/4@632,8 nm
Coatings	Antireflective coatings @2,1 μm + 3,5-5 μm on both sides
Nominal absorption coefficient	≤0,04 cm ⁻¹ @2,1 μm, o-wave
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	ZnGeP ₂
Crystal structure	Tetragonal, 42m
Lattice parameters	a = 5,465 Å, c = 10,708 Å
Optical symmetry	Positive uniaxial (n _e > n _o)
Density	4,162 g/cm ³
Mohs hardness	5,5
Transparency range	0,74 - 12 μm @0° transmittance level
Dispersion equations @1,5 - 10,59 μm range, T = 293 K (λ in μm)	n _o ² = 11,6413 + 0,69363/(λ ² - 0,21967) + 1586,06/(λ ² - 832,75); n _e ² = 12,1438 + 0,75255/(λ ² - 0,21913) + 2061,68/(λ ² - 951,07)
Refractive indices	n _o = 3,0738; n _e = 3,1137 @10,5 μm
Thermal conductivity @T = 293 K	36 (llc) Wm ⁻¹ K ⁻¹ , 35 (Lc) Wm ⁻¹ K ⁻¹
Laser induced damage threshold	60 MW/cm ² @10,6 μm, 100 ns

Guidance

Optogama provides guidance and theoretical calculations for particular ZnGeP₂ applications. Contact us and we will help you to configure your crystal.

Standard products

FACE DIMENSIONS	LENGTH	THETA	PHI	COATINGS	APPLICATION	SKU	PRICE
5 x 5 mm	10 mm	55,3°	0°	AR@2,1 μm + BBAR@3,5-5 μm	MWIR generation, type I, eeo interaction	15358	Request
	15 mm	55,3°	0°	AR@2,1 μm + BBAR@3,5-5 μm	MWIR generation, type I, eeo interaction	15359	Request
	20 mm	55,3°	0°	AR@2,1 μm + BBAR@3,5-5 μm	MWIR generation, type I, eeo interaction	15360	Request



GaSe crystals

Main features

- Broad transparency range from 0,65 μm to 18 μm
- Large nonlinearity and birefringence
- Soft and cleaves along [001] plane
- Cannot be cut and polished at certain angles
- Comes uncoated and mounted for proper handling

Application examples

- Broadband mid-IR difference frequency generation
- Second harmonic (SH) of CO_2 , CO, dye lasers
- Terahertz (THz) generation by optical rectification
- Terahertz detectors for terahertz time domain spectroscopy (THz-TDS)

Optogama offer z-cut, cleaved surface and mounted gallium selenide (GaSe) crystals. Custom clear apertures and crystal thicknesses from tens of microns up to several millimeters are available upon request. Due to fragile nature of GaSe it is not possible to apply antireflection coatings.

Standard specifications

GaSe crystals	
Clear aperture	$\geq \varnothing 7$ mm or custom
Surface quality	Cleaved surfaces
Coatings	Uncoated, unavailable
Mount	$\varnothing 25,4$ mm black anodized aluminum mount

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	GaSe
Crystal structure	Hexagonal, -62m
Lattice parameters	$A = 3,742 \text{ \AA}$, $c = 15,918 \text{ \AA}$
Optical symmetry	Negative uniaxial (no>ne)
Density	5,03 g/cm ³
Mohs hardness	≈ 0
Transparency range	0,62-20 μm @ "0" transmittance level
Sellmeir equations	$n_o^2 = 7,443 + 0,4050/\lambda^2 + 0,0186/\lambda^4 + 0,0061/\lambda^6 + 3,1485 \lambda^2/(\lambda^2 - 2194)$; $n_e^2 = 5,76 + 0,3879/\lambda^2 - 0,2288/\lambda^4 + 0,1223/\lambda^6 + 1,8550 \lambda^2/(\lambda^2 - 1780)$
Refractive indices	$n_o = 2,8158$; $n_e = 2,4392$ @10,6 μm

Guidance

Optogama provides guidance and theoretical calculations for particular GaSe applications. Contact us and we will help you to configure your crystal.

Standard products

CLEAR APERTURE	LENGTH	ORIENTATION	COATINGS	SKU	PRICE
$\geq \varnothing 7$ mm	0,2 mm	z-cut	Uncoated	31313	1900 €
	0,5 mm	z-cut	Uncoated	31124	1700 €
	1 mm	z-cut	Uncoated	31126	2100 €
	2 mm	z-cut	Uncoated	31127	2400 €



Inelastic photon-phonon-interaction in Raman crystals gives rise to Stokes or anti-Stokes shift of pump radiation. It is the so-called Stimulated Raman scattering (SRS). This is a versatile method for frequency conversion, which does not need to be phase-matched, features a high conversion efficiency and is easily compatible with current solid-state lasers. Suchlike Raman generator emission lines can cover

the wavelength range from UV to NIR due to cascaded SRS. For a selective Raman shift line amplification, the Raman crystal has to be placed into a resonator with an appropriate optical feedback.

Optogama provide barium nitrate and undoped KGW, KYW Raman crystals. Do not hesitate to request custom, if desired crystals are not present in the standard list.

Raman crystals

an als



Barium nitrate
crystals



KGW crystals



KYW crystals

Barium nitrate crystals

Main features

- Transparency range from 350 nm to 1800 nm
- Raman frequency shift of 1048 cm⁻¹
- Excellent Raman shifter for nanosecond applications
- Custom crystal dimensions and coatings available upon request

Application examples

- External cavity Raman laser pumped by commercially available passively Q-switched nanosecond Nd:YAG laser
- Generation of 1,59 μm "eye-safe" radiation, which coincides with CO₂ absorption line

Barium nitrate (Ba(NO₃)₂) is one of the leading crystals among solid-state Raman shifters in terms of Raman gain coefficient, which is known to be the highest at nanosecond steady-state regime ($g_R = 47 \text{ cm/GW@532 nm}$ pump). Barium nitrate also features a moderately broad transparency range (0,33 μm - 1,8 μm) and high damage threshold. Drawbacks of barium nitrate crystal are low thermal conductivity (1,17 Wm⁻¹K⁻¹) and high thermo-optic coefficient ($dn/dT = -20 \times 10^{-6} \text{K}^{-1}$), which lead to the thermal lensing effect. The crystal is soft and hygroscopic, therefore should be treated with caution. Optogama recommend using barium nitrate as a Raman shifter for nanosecond applications.

Standard specifications

BARIUM NITRATE CRYSTALS	
Orientation	[110]
Clear aperture	>85%
Face dimensions tolerance	±0,5 mm
Length tolerance	±1 mm
Parallelism error	<5 arcmin
Perpendicularity error	<10 arcmin
Protective chamfers	<0,25 mm at 45°
Surface quality	40-20 S-D
Surface flatness	<λ/4@632,8 nm
Coatings	AR/AR@500-700 nm
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns
Mount	Unmounted

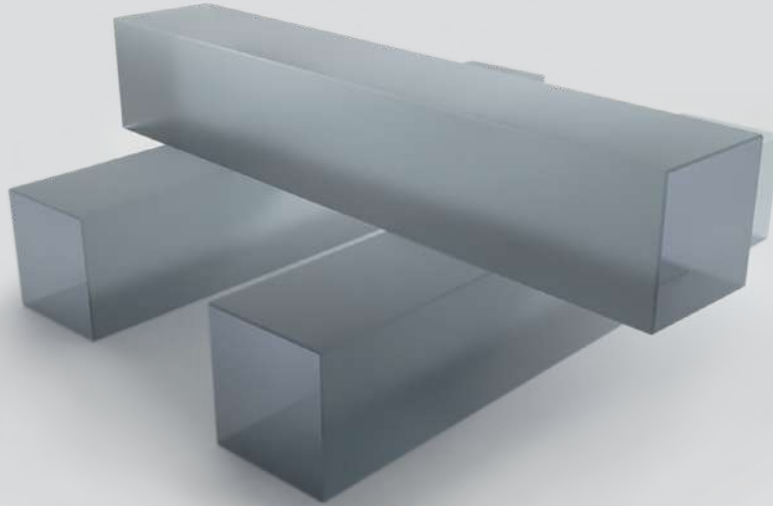
Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	Ba(NO ₃) ₂
Crystal structure	Cubic, P2 ₁ 3
Lattice parameters	a = b = c = 8,11 Å
Density	3,25 g/cm ³
Mohs hardness	2,5-3
Transparency range	0,33 μm - 1,8 μm
Refractive index	1,555@1064 nm
Thermal conductivity	1,17 Wm ⁻¹ K ⁻¹ @llc
Thermal expansion coefficient	13×10 ⁻⁶ 1 °C ⁻¹
dn/dT	-20×10 ⁻⁶ K ⁻¹
Raman frequency shift	1047 cm ⁻¹
Raman linewidth	0,4 cm ⁻¹
Raman gain (ns, steady-state regime)	47 cm/GW@532 nm 11 cm/GW@1064 nm
Dephasing time	28 ps

Standard products

FACE DIMENSIONS	LENGTH	COATINGS	SKU	PRICE
5 x 5 mm	15 mm	AR/AR@500-700 nm	28479	870 €
	30 mm	AR/AR@500-700 nm	28480	1050 €
	45 mm	AR/AR@500-700 nm	28481	1240 €
	75 mm	AR/AR@500-700 nm	28482	1410 €
8 x 8 mm	75 mm	AR/AR@500-700 nm	28482	1410 €

Minimum order quantity: 2 pieces.



KGW crystals

Main features

- Broad transparency range from 300 nm to 5 μm
- Two pump polarization-dependent Raman shifts at 768 cm^{-1} and 901 cm^{-1}
- Excellent Raman shifter for picosecond applications
- Custom dimensions, orientation, and coatings available upon request

Application examples

- Raman generator pumped by commercially available picosecond Nd:YAG laser

Potassium gadolinium tungstate ($\text{KGd}(\text{WO}_4)_2$, KGW) crystals feature good mechanical properties, relatively good thermal conductivity ($2,5\text{-}3,4 \text{ Wm}^{-1}\text{K}^{-1}$) and wide transparency range, which spans from 350 nm to 5 μm . KGW as a Raman crystal features two large Raman modes at 768 cm^{-1} and 901 cm^{-1} , which are pump polarization dependent. Optogama recommend using KGW crystal as a Raman shifter for picosecond applications.

Standard specifications

KGW CRYSTALS	
Orientation	b-cut
Clear aperture	>90%
Face dimensions tolerance	+0,0/-0,1 mm
Length tolerance	$\pm 0,1$ mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	< $\lambda/8$ @632,8 nm
Wavefront distortion	< $\lambda/4$ @632,8 nm
Coatings	AR(R<0,7%)@500-650 nm
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	$\text{KGd}(\text{WO}_4)_2$
Crystal structure	Monoclinic, C2c
Lattice parameters	a = 10,652(4) Å, b = 10,374(6) Å, c = 7,582(2) Å
Density	7,27 g/cm ³
Mohs hardness	4-5
Transparency range	0,3 μm - 5 μm
Refractive indices@1064 nm	$n_o = 1,982$ $n_e = 2,010$ $n_g = 2,061$
Thermal conductivity	$K_x = 2,6 \text{ Wm}^{-1}\text{K}^{-1}$ $K_y = 3,8 \text{ Wm}^{-1}\text{K}^{-1}$ $K_z = 3,4 \text{ Wm}^{-1}\text{K}^{-1}$
dn/dT	$dn_o/dT = -15,7 \times 10^{-6} \text{K}^{-1}$ $dn_e/dT = -11,8 \times 10^{-6} \text{K}^{-1}$ $dn_g/dT = -17,3 \times 10^{-6} \text{K}^{-1}$
Raman frequency shift	901 cm^{-1} (p[mm]p), 767 cm^{-1} (p[gg]p)
Raman linewidth	5,4 cm^{-1} @901 cm^{-1} (p[mm]p) 6,4 cm^{-1} @767 cm^{-1} (p[gg]p)
Raman gain (ps, transient-state regime)	11 cm/GW@532 nm 3 cm/GW@1064 nm
Dephasing time	2 ps

Standard products

FACE DIMENSIONS	LENGTH	COATINGS	SKU	PRICE
5 x 5 mm	15 mm	Uncoated	7259	440 €
		AR/AR@450-800 nm	7262	600 €
	30 mm	Uncoated	7260	600 €
		AR/AR@450-800 nm	7263	780 €
	45 mm	Uncoated	7261	860 €
		AR/AR@450-800 nm	7264	1070 €
	50 mm	Uncoated	22033	900 €
		AR/AR@450-800 nm	11429	1120 €

KYW crystals

Main features

- Broad transparency range from 350 nm to 5,5 μm
- Two large Raman shifts of 765 cm^{-1} and 905 cm^{-1}

Application examples

- Raman lasers
- Radiation frequency tuning

Potassium yttrium tungstate ($\text{KY}(\text{WO}_4)_2$, KYW) crystals offer two strong phonon modes around 765 cm^{-1} and 905 cm^{-1} , which have similar Raman gain and are pump polarization dependent. KYW crystals possess good mechanical properties, high optical damage threshold, broad transparency range (350 nm - 5,5 μm) and thermal conductivity around three times higher than barium nitrate.

Standard specifications

KYW CRYSTALS	
Orientation	b-cut
Clear aperture	>90%
Face dimensions tolerance	+0/-0,1 mm
Length tolerance	$\pm 0,1$ mm
Parallelism error	<20 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0,1 mm at 45°
Surface quality	10-5 S-D
Surface flatness	<N/8@632,8 nm
Wavefront distortion	<N/4@632,8 nm
Coatings	AR(R<0,7%)@500-650 nm
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns
Mount	Unmounted

Properties

PHYSICAL AND OPTICAL PROPERTIES	
Chemical formula	$\text{KY}(\text{WO}_4)_2$
Crystal structure	Monoclinic, C2/c
Lattice parameters	a = 10,64 Å, b = 10,32 Å, c = 7,55 Å
Density	6,61 g/cm ³
Mohs hardness	4-5
Transparency range	0,35-5,5 μm
Refractive indices (1064 nm, room temperature)	$n_o = 1,9688$ $n_m = 2,0065$ $n_e = 2,0507$
Thermal conductivity (average value)	3,3 Wm ⁻¹ K ⁻¹
dn/dT	$dn_o/dT = -14,6 \times 10^{-6} \text{ K}^{-1}$ $dn_m/dT = -8,9 \times 10^{-6} \text{ K}^{-1}$ $dn_e/dT = -12,4 \times 10^{-6} \text{ K}^{-1}$
Raman frequency shift (T = 300 K)	905 cm^{-1} (E N _o) 765 cm^{-1} (E N _e)
Raman gain (1064 nm pump, steady-state regime)	3,6 cm/GW

Standard products

FACE DIMENSIONS	LENGTH	COATINGS	SKU	PRICE
5 x 5 mm	15 mm	Uncoated	7273	440 €
		AR/AR@450-800 nm	7276	600 €
	30 mm	Uncoated	7274	600 €
		AR/AR@450-800 nm	7277	780 €
	45 mm	Uncoated	7275	860 €
		AR/AR@450-800 nm	7278	1070 €
	50 mm	Uncoated	31051	900 €
		AR/AR@450-800 nm	31052	1120 €



Photo fracti cryst

Optogama provide BSO, Fe:LiNbO₃, SBN and BGO crystals not mainly, but necessarily for applications, which exploit photorefractive effect. Photorefractive effect is a phenomenon whereby the local index of refraction is modified by spatial variations of light intensity. It is observed when coherent light interferes with

each other in photorefractive material, which forms a spatially varying pattern of illumination. The effect can be used to store temporary, erasable holograms, also known as holographic data storage. It can also be used to create phase-conjugate mirrors or optical spatial solitons.

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BSO crystals



Fe:LiNbO₃ crystals



SBN crystals



BGO crystals

BSO crystals

Main features

- High electro-optic coefficient ($r_{41} = 5 \text{ pm/V}$)
- High phase-conjugation efficiency
- Available in large size elements or wafers up to 3"
- Customization available upon request

Application examples

- Spatial light modulators
- Optical switches
- Pockels readout optical memory (PROM) applications
- Optical waveguides

Bismuth silicon oxide ($\text{Bi}_{12}\text{SiO}_{20}$, BSO) crystals are highly efficient photoconductors with a low dark conductivity, that allows a build-up of large photo-induced space-charges. Tremendous photoconductivity and electro-optic properties make BSO crystals attractive in a range of applications: spatial light modulators, optical switches, phase conjugation mixers. BSO crystals are grown by modified Czochralski method and available in up to 3" diameter aperture size. Crystals can be supplied with ITO coatings on request.

Standard specifications

BSO CRYSTALS	
Clear aperture	85%
Face dimensions tolerance	+0.1/-0.25 mm
Thickness tolerance	$\pm 0.2 \text{ mm}$
Parallelism error	<30 arcsec
Protective chamfers	<0.3 mm at 45°
Surface quality	40-20 S-D
Wavefront distortion	<N/4@632.8 nm
Coatings	Uncoated
Mount	Unmounted

Properties

MAIN PROPERTIES	
Chemical formula	$\text{Bi}_{12}\text{SiO}_{20}$
Crystal structure	Cubic, point group 23
Lattice parameters	10.10 Å
Density	9.2 g/cm ³
Mohs hardness	5
Transmission Range	0.45-6 μm
Refractive Index	2.54@0.63 μm
Optical Activity	42 deg/mm@500 nm
Electro-optic coefficient	$r_{41} = 5 \text{ pm/V}$
Dielectric constant (low frequency)	56
Dark resistance	10^{14} Ohm cm

Standard products

FACE DIMENSIONS	LENGTH	ORIENTATION	SKU	PRICE
5 x 5 mm	5 mm	[100]	6885	Request
	5 mm	[110]	6884	Request
10 x 10 mm	5 mm	[100]	6883	Request
	5 mm	[110]	6882	Request
20 x 20 mm	1,1 mm	[100]	6881	490 €
	1,1 mm	[110]	6880	490 €
25 x 25 mm	1,1 mm	[110]	27782	570 €
30 x 30 mm	1,1 mm	[110]	1558	690 €
	1,4 mm	[110]	9095	690 €



BGO crystals

Main features

- High electro-optic coefficient ($r_{41} = 3,5 \text{ pm/V}$)
- Low dark conductivity
- Large size elements or wafers up to 3"
- Customization available upon request

Application examples

- Spatial light modulators
- Optical switches
- Optical correlators

Bismuth germanite ($\text{Bi}_{12}\text{GeO}_{20}$, BGO) crystals are highly efficient photoconductors with a low dark conductivity, that allows a build-up of large photo-induced space-charges. Tremendous photoconductivity and electro-optic properties make BSO crystals attractive in a range of applications: spatial light modulators, optical switches, phase conjugation mixers. BSO crystals are grown by modified Czochralski method and available in up to 3" diameter aperture size. Crystals can be supplied with ITO coatings on request.

Standard specifications

BGO CRYSTALS	
Clear aperture	85%
Face dimensions tolerance	+0,1/-0,25 mm
Thickness tolerance	$\pm 0,2 \text{ mm}$
Parallelism error	<30 arcsec
Protective chamfers	<0,3 mm at 45°
Surface quality	40-20 S-D
Wavefront distortion	< $\lambda/4$ @632,8 nm
Coatings	Uncoated
Mount	Unmounted

Properties

MAIN PROPERTIES	
Chemical formula	$\text{Bi}_{12}\text{GeO}_{20}$
Crystal structure	Cubic, point group 23
Lattice parameters	10,15 Å
Density	9,2 g/cm ³
Transmission Range	0,45-7 μm
Refractive Index @0,63 μm	2,55
Optical Activity @500 nm	41,5 deg/mm
Electro-Optic Coefficient r_{41}	3,5 pm/V
Dielectric constant	40
Dark Resistance	10^{14} Ohm cm

Standard products

FACE DIMENSIONS	LENGTH	ORIENTATION	SKU	PRICE
20 x 20 mm	1,1 mm	[100]	6875	490 €
	1,1 mm	[110]	6874	490 €
25 x 25 mm	1,1 mm	[110]	31146	570 €
30 x 30 mm	1,1 mm	[110]	6876	690 €
	1,4 mm	[110]	6877	690 €

Fe:LiNbO₃ crystals

Main features

- High electro-optic coefficient ($r_{41} = 5 \text{ pm/V}$)
- High phase conjugation efficiency
- Available in large size elements or wafers up to 3"
- Customization available upon request

Application examples

- Spatial light modulators
- Optical switches
- Holographic recording
- Optical waveguides

Lithium niobate (LiNbO₃, LN) crystal doped with iron (Fe:LiNbO₃) is an attractive photorefractive material, due to the high photorefractive sensitivity, high electro-optic coefficients and diffraction efficiency, chemo-mechanical properties. Fe:LiNbO₃ crystals are grown by Czochralsky method and available in large size. Wide range of available dopants and levels enable to adjust material properties for particular applications. What is more, Fe:LiNbO₃ crystals are easy to handle, low cost, therefore suitable for volume production.

Standard specifications

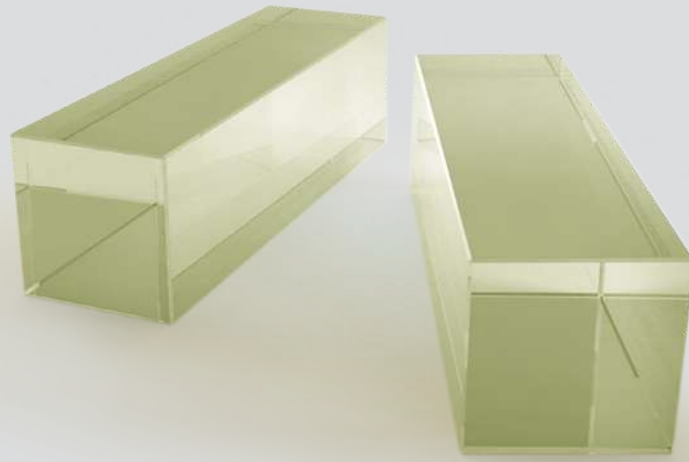
FE:LiNbO ₃ CRYSTALS	
Dopant level, Fe ₂ O ₃	0.02 mol. % 0.03 mol. % 0.05 mol. % 0.1 mol. %
Orientation	90° cut (X-cut, Y-cut)
Clear aperture	85%
Face dimensions tolerance	+0/-0.2 mm
Thickness tolerance	±0.2 mm
Parallelism error	<3 arcmin
Protective chamfers	<0.3 mm at 45°
Surface quality	20-10 S-D
Wavefront distortion	<λ/4@632.8 nm
Coatings	None, antireflective or indium tin oxide coatings available upon request
Electrodes	None, available upon request
Mount	Unmounted

Properties

MAIN PROPERTIES	
Chemical formula	Fe:LiNbO ₃
Crystal structure	Trigonal, 3m
Density	4,64 g/cm ³
Mohs hardness	5
Transmission range	0,35-5,5 μm
Refractive index @0.63 μm	$n_o = 2,20$ $n_e = 2,29$
Electro-optic coefficients	$r_{22} = 6,8 \text{ pm/V}$ $r_{31} = 10 \text{ pm/V}$ $r_{32} = 32 \text{ pm/V}$
Dielectric constant	$\epsilon_{11} = 85$ $\epsilon_{33} = 30$

Standard products

FACE DIMENSIONS	LENGTH	DOPING	SKU	PRICE
10 x 10 mm	1 mm	0.02 % Fe ₂ O ₃	7006	Request
		0.03 % Fe ₂ O ₃	7007	Request
		0.05 % Fe ₂ O ₃	7008	Request
		0.1 % Fe ₂ O ₃	7009	Request
	5 mm	0.02 % Fe ₂ O ₃	6457	Request
		0.03 % Fe ₂ O ₃	6458	Request
		0.05 % Fe ₂ O ₃	4052	Request
		0.1 % Fe ₂ O ₃	7005	Request
20 x 20 mm	1 mm	0.02 % Fe ₂ O ₃	7010	Request
		0.03 % Fe ₂ O ₃	7011	Request
		0.05 % Fe ₂ O ₃	7012	Request
		0.1 % Fe ₂ O ₃	7013	Request



SBN crystals

Main features

- Pure or doped with Ce
- Efficient phase-conjugation
- Custom size, doping level, unpoled, antireflective coated and electrodeless crystals are available upon request

Application examples

- Optical information recording
- Pyroelectrical detectors
- Self-pumped self-conjugation mirror
- Optical correlators

Strontium-barium niobate ($\text{Sr}_x\text{Ba}_{1-x}\text{Nb}_2\text{O}_6$, SBN:x, $x = 61$) crystals feature excellent optical and photorefractive properties. They are available nominally pure or doped with Ce. Different composition SBN crystals found their application in electro-optics, acousto-optics, photorefractive, non-linear optics fields. Optogama provide inclusion-free and homogenous SBN crystals, which are grown by Modified Stepanov method and available with linear dimensions up to 40 mm.

Standard specifications

SBN:61 CRYSTALS	
Orientation	Short edge along tetragonal axis
Poling	Poled or unpoled
Electrodes	Carbon-water electrodes or no electrodes
Clear aperture	85%
Face dimensions tolerance	+0/-0,2 mm
Thickness tolerance	±0,2 mm
Parallelism error	<30 arcsec
Protective chamfers	<0,1 mm at 45°
Surface quality	40-20 S-D over clear aperture, 80-50 S-D other surfaces
Surface flatness	<λ/4@632,8 nm
Coatings	Uncoated
Mount	Unmounted

Properties

MAIN PROPERTIES	
Composition	SBN:61
Crystal structure	Tetragonal, 4 mm
Lattice parameters	$a = 12,46 \text{ \AA}$, $c = 3,946 \text{ \AA}$
Density	5,4 g/cm ³
Mohs hardness	5,5
Melting temperature	1480°C
Curie temperature	75°C
Transparency range	0,45-5,5 μm
Refractive index @633 nm	$n_o = 2,3103$ $n_e = 2,2817$
Δn @633 nm	-0,0286
Half-wave voltage (λ/2)	240 V
Dielectric constant, (T = 293 K)	900
Electro-optic coefficients	$r_{13} = 45 \text{ pm/V}$ $r_{33} = 250 \text{ pm/V}$
Pyroelectric coefficient	0,065 μC cm ⁻² K ⁻¹
Dielectric constant	880

Standard products

MATERIAL	FACE DIMENSIONS	LENGTH	DOPING	SKU	PRICE	
SBN:61	5 x 5 mm	5 mm	Undoped	73	1850 €	
			CeO2 0,002 wt, %	6940	1850 €	
			CeO2 0,01 wt, %	6944	1850 €	
			Undoped	74	2250 €	
			CeO2 0,002 wt, %	6941	2250 €	
			CeO2 0,01 wt, %	6945	2250 €	
		10 mm	Undoped	75	2750 €	
			CeO2 0,002 wt, %	6942	2750 €	
			CeO2 0,01 wt, %	6946	2750 €	
			15 mm	Undoped	75	2750 €
				CeO2 0,002 wt, %	6942	2750 €
				CeO2 0,01 wt, %	6946	2750 €



Take a tour through a standard list of Optogama laser components, including dielectric thin-film mirrors, metal-coated mirrors, beamsplitters, lenses, prisms, windows, substrates, and filters for ultraviolet, visible and infrared applications. Do not hesitate to request custom, if particular components that you are looking for are not in the standard list.

Laser components

r o - s



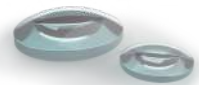
Coated laser components



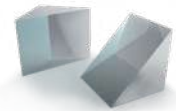
Metal-coated mirrors



Beamsplitters



Lenses



Prisms



Windows and substrates



Filters



Coated laser components

Optogama provides dielectric thin-film and metal-coated laser components for use in the ultraviolet, visible, and infrared wavelength ranges. Non-standard components are available upon request. Contact us for custom solutions and pricing. Optogama standard dielectric thin-film coated mirrors are designed for laser-line, broadband, multi-wavelength and beam-splitting or combining applications. Standard dielectric thin-film optical elements also include laser cavity output couplers

and variable reflectivity mirrors, which are primarily used as output mirrors for stable and unstable laser resonators, respectively. Metal-coated mirrors are an excellent choice for applications, where uniform, broadband, low GDD, nearly angle of incidence insensitive reflectance is required. Optogama provide standard flat and curved metal-coated mirrors with the following metal-coatings: UV enhanced aluminum, protected aluminum, protected silver, enhanced silver and protected gold.

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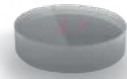
Laser line mirrors



Broadband laser mirrors



Dual and multi-wavelength mirrors



Variable reflectivity mirrors



Laser cavity output couplers



Low GDD ultrafast mirrors



Wavelength separators and combiners



Metal-coated mirrors

Laser line mirrors



Main features

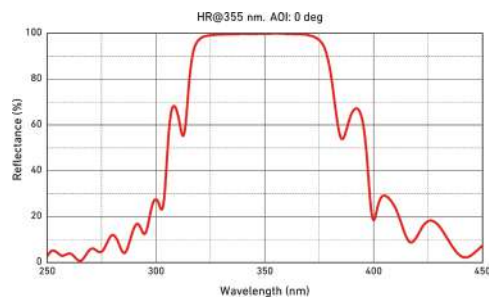
- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- 0° or 45° angle of incidence selection
- Designed for a high reflectance over a certain spectral range and angle of incidence
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- Nearly loss-free light steering and folding in laser-based systems

Standard specifications

LASER LINE MIRRORS	
Substrate material	UV grade fused silica
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	$\pm 0,25$ mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	$< \lambda/8 @ 632,8$ nm
Laser induced damage threshold	>12 J/cm ² @1064 nm, 10 ns (for 1020-1070 nm mirrors)



Laser line mirrors exhibit high reflectance over a particular spectral range, extending <10% of the central wavelength, at a specific angle of incidence and polarization for non-normal incidence. Reflectance properties are based on the optical interference phenomena of reflections from multiple dielectric thin-film layers, which are carefully deposited on UV grade fused silica optical substrates.

Standard products

MATERIAL	DIMENSIONS	WAVELENGTH RANGE	REFLECTANCE	AOI	SKU	PRICE
UVFS	$\varnothing 25,4 \times 5$ mm	254-266 nm	>99,3%	0°	6375	75 €
	$\varnothing 25,4 \times 5$ mm	340-355 nm	>99,5%	0°	6376	60 €
	$\varnothing 25,4 \times 5$ mm	340-355 nm	>99,85%	0°	9280	110 €
	$\varnothing 25,4 \times 5$ mm	385-415 nm	>99,5%	0°	6377	60 €
	$\varnothing 25,4 \times 5$ mm	510-535 nm	>99,5%	0°	6378	60 €
	$\varnothing 25,4 \times 5$ mm	510-535 nm	>99,9%	0°	9281	90 €
	$\varnothing 25,4 \times 5$ mm	770-830 nm	>99,5%	0°	6379	60 €
	$\varnothing 25,4 \times 5$ mm	1020-1070 nm	>99,5%	0°	6386	60 €
	$\varnothing 25,4 \times 5$ mm	1020-1070 nm	>99,95%	0°	9282	110 €
	$\varnothing 25,4 \times 5$ mm	1520-1570 nm	>99,5%	0°	6380	75 €
	$\varnothing 25,4 \times 5$ mm	1890-1990 nm	>99,5%	0°	6381	85 €
	$\varnothing 25,4 \times 5$ mm	2000-2100 nm	>99,5%	0°	6382	95 €
	$\varnothing 25,4 \times 5$ mm	254-266 nm	Rs>99,5%, Rp>98,5%	45°	6383	75 €
	$\varnothing 25,4 \times 5$ mm	340-355 nm	Rs>99,6%, Rp>99,2%	45°	6384	60 €
	$\varnothing 25,4 \times 5$ mm	340-355 nm	Rs>99,85%, Rp>99,7%	45°	9283	120 €
	$\varnothing 25,4 \times 6,35$ mm	510-532 nm	Rs>99,6%, Rp>99,0%	$0-45^\circ$	15207	86 €
	$\varnothing 25,4 \times 5$ mm	510-535 nm	Rs>99,6%, Rp>99,2%	45°	6385	60 €
	$\varnothing 25,4 \times 5$ mm	510-535 nm	Rs>99,95%, Rp>99,85%	45°	9284	95 €
	$\varnothing 25,4 \times 5$ mm	385-415 nm	Rs>99,6%, Rp>99,2%	45°	6387	60 €
	$\varnothing 25,4 \times 5$ mm	770-830 nm	Rs>99,6%, Rp>99,2%	45°	6388	60 €
	$\varnothing 25,4 \times 6,35$ mm	1020-1070 nm	Rs>99,6%, Rp>99,0%	$0-45^\circ$	15208	86 €
	$\varnothing 25,4 \times 5$ mm	1020-1070 nm	Rs>99,6%, Rp>99,2%	45°	6389	60 €
	$\varnothing 25,4 \times 5$ mm	1020-1070 nm	Rs>99,95%, Rp>99,85%	45°	9285	120 €
	$\varnothing 25,4 \times 5$ mm	1520-1570 nm	Rs>99,6%, Rp>99,2%	45°	6390	75 €
	$\varnothing 25,4 \times 5$ mm	1890-1990 nm	Rs>99,6%, Rp>99,2%	45°	6392	85 €
	$\varnothing 25,4 \times 5$ mm	2000-2100 nm	Rs>99,6%, Rp>99,2%	45°	6391	95 €

Broadband laser mirrors

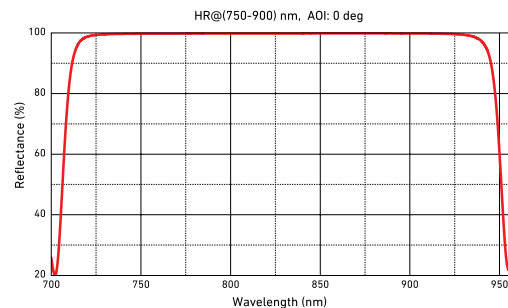
Main features

- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- Designed for a high reflectance (>99%) over a broad wavelength range
- 0° or 45° angle of incidence selection
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- High reflectivity mirrors for tunable and broadband laser sources
- Broadband light beam steering and folding

Broadband laser mirrors provide high average reflectance over a broad spectral range at a specific angle of incidence and polarization for non-normal incidence. These properties are based on the optical interference phenomena of reflections from multiple dielectric thin-film layers, which are carefully deposited on UV grade fused silica optical substrates.

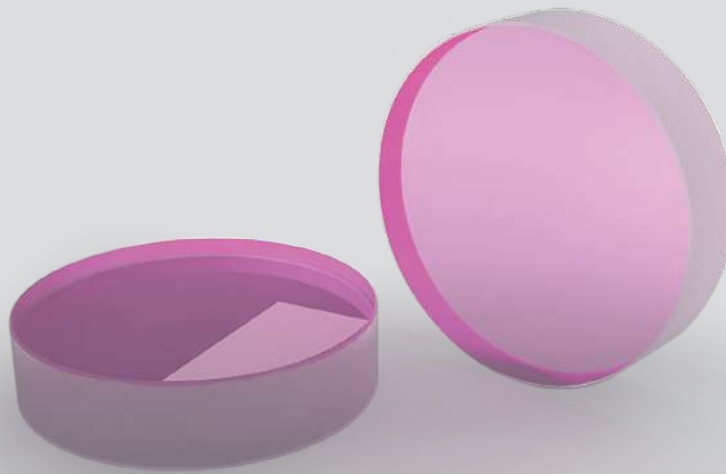


Standard specifications

BROADBAND LASER MIRRORS	
Substrate material	UV grade fused silica
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	$\pm 0,25$ mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 5-D
Surface flatness	< $\lambda/8$ @632,8 nm
Laser induced damage threshold	1 J/cm ² @1064 nm, 10 ns (for 750-1100 nm mirrors)

Standard products

MATERIAL	DIMENSIONS	WAVELENGTH RANGE	AVERAGE REFLECTANCE	AOI	SKU	PRICE
UVFS	$\varnothing 25,4 \times 5$ mm	350-400 nm	>99%	0°	6289	Request
		400-700 nm	>99%	0°	6290	85 €
		750-1100 nm	>99%	0°	6323	Request
		1280-1600 nm	>99%	0°	6326	Request
		350-400 nm	>99% (s+p)/2	45°	6327	Request
		400-700 nm	>99% (s+p)/2	45°	6324	85 €
		750-1100 nm	>99% (s+p)/2	45°	6328	Request
		1280-1600 nm	>99% (s+p)/2	45°	6325	Request



Dual and multi wavelength mirrors

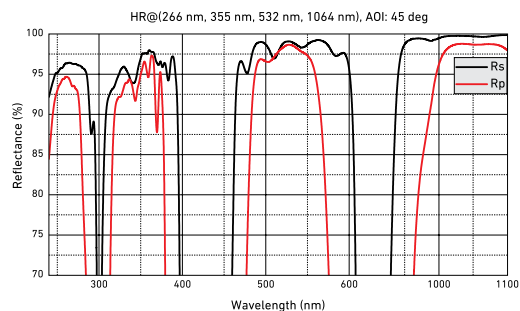
Main features

- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- Designed for a high reflectance over a certain spectral range and angle of incidence
- 0° or 45° angle of incidence selection
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- Simultaneous beam steering and folding of fundamental radiation laser beam and its harmonics
- Laser system alignment using visible wavelength laser

Dual and multi wavelength mirrors provide a high reflectance over several certain spectral ranges at a specific angle of incidence and polarization for non-normal incidence. Reflectance properties are based on the optical interference phenomena of reflections from multiple dielectric thin-film layers, which are carefully deposited on UV grade fused silica optical substrates.



Standard specifications

DUAL AND MULTI WAVELENGTH MIRRORS	
Substrate material	UV grade fused silica
Substrate dimensions	$\varnothing 25,4 \times 5$ mm
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	$\pm 0,25$ mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<N/8@632,8 nm
Laser induced damage threshold	4 J/cm ² @1064 nm, 10 ns (for 510-535 nm + 1020-1070 nm mirrors)

Standard products

MATERIAL	DIMENSIONS	WAVELENGTH RANGE	REFLECTANCE	AOI	SKU	PRICE
UVFS	$\varnothing 25,4 \times 5$ mm	254-266 nm + 510-535 nm	>99%	0°	6330	105 €
		385-415 nm + 770-830 nm	>99,5%	0°	6331	85 €
		510-535 nm + 1020-1070 nm	>99,5%	0°	6332	85 €
		254-266 nm + 340-355 nm + 510-535 nm + 1020-1070 nm	>97%	0°	6329	145 €
		254-266 nm + 510-535 nm	Rs>99%, Rp>98%	45°	6334	105 €
		385-415 nm + 770-830 nm	Rs>99,5%, Rp>98,5%	45°	6335	85 €
		510-535 nm + 1020-1070 nm	Rs>99,5%, Rp>98,5%	45°	6336	85 €
		254-266 nm + 340-355 nm + 510-535 nm + 1020-1070 nm	Rs>97%, Rp>94%	45°	6333	145 €



Variable reflectivity mirrors

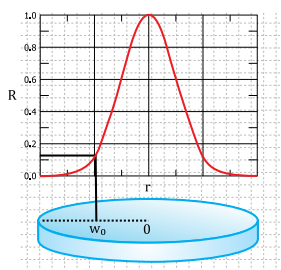
Main features

- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are ø25,4 x 5 mm
- Central reflectance from 15% to 35% at 1064 nm wavelength
- Custom reflectance profiles, substrates material and dimensions are available upon request

Application examples

- Laser cavity output coupler for unstable laser resonator

Optogama variable reflectivity mirrors provide a circularly symmetric reflectance profile according to the super-Gaussian function with order of 2. These mirrors are favorable in high-power unstable laser resonators for their wide filling of the active medium and weak diffraction on hard-edge aperture. Therefore, super-Gaussian variable reflectivity mirrors contribute to better near- and far-field beam quality. It is worth to mention that variable reflectivity mirrors can be designed to have various reflectance profiles, such as linear, parabolic, Gaussian.



Function of reflection:

$$R = R_0 \times \exp \left[-2 \left(\frac{r}{w_0} \right)^n \right]$$

Herewith:

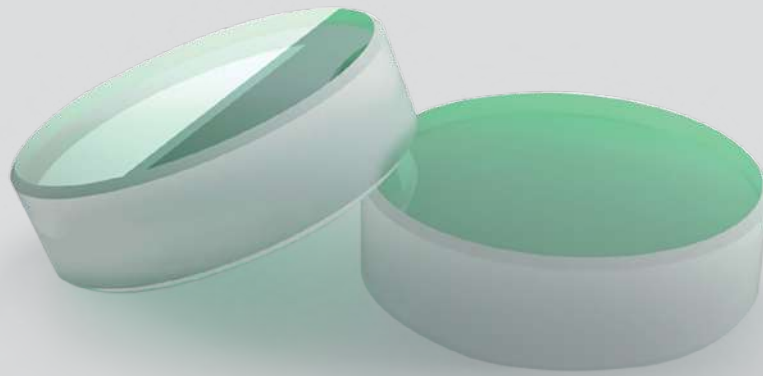
R_0 - peak reflectance
 r - radial coordinate
 w_0 - radius at R_0/e^2 level
 n - Gaussian order

Standard specifications

VARIABLE REFLECTIVITY MIRRORS	
Radius w_0	2 mm
Gaussian order n	2
Substrate material	UV grade fused silica
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	±0,25 mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/8@632,8 nm
Rear surface	Antireflective coated
Laser induced damage threshold	>6 J/cm²@1064 nm, 10 ns

Standard products

MATERIAL	DIMENSIONS	WAVELENGTH	CENTRAL REFLECTANCE	SKU	PRICE
UVFS	ø25,4 x 5 mm	1064 nm	15%	6539	Request
			20%	6540	Request
			25%	6541	Request
			30%	6542	Request
			35%	6543	Request



Laser cavity output couplers

Main features

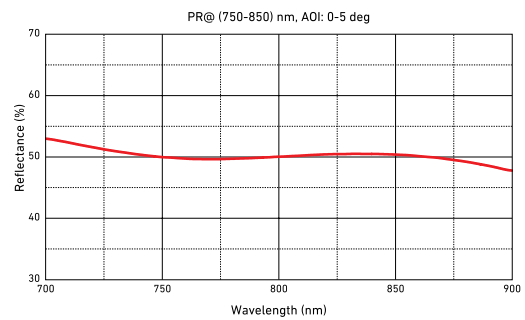
- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- 50% - 99% reflectance selection at most popular wavelength ranges
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- Output couplers for stable laser resonators
- Partial reflectors (beam attenuators)

Standard specifications

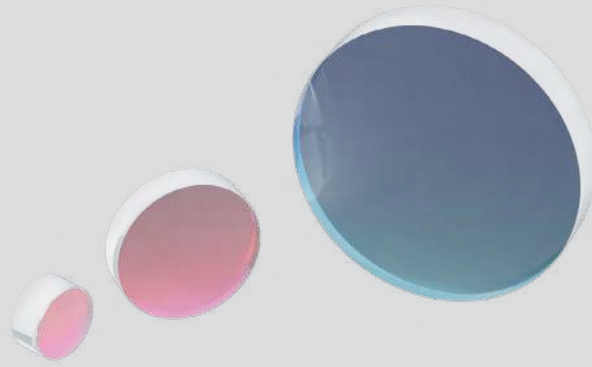
LASER CAVITY OUTPUT COUPLERS	
Substrate material	UV grade fused silica
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	$\pm 0,25$ mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	$< \lambda/8 @ 632,8$ nm
Rear side	Antireflective coated at operating wavelength range
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns (for 1020-1070 nm couplers)



Output couplers are used in stable laser resonators in order to emit a part of the energy, which is circulating in the laser cavity. One has to carefully select the proper spatially constant reflection/transmission ratio of the output coupler in order to optimize the lasing operation and prevent from damaging intracavity optical elements. Front surface of output couplers is partially reflective coated at a certain wavelength range, while the rear surface is antireflective coated in order to prevent Fresnel reflection losses. What is more, these laser cavity output couplers can be successfully implemented as fixed ratio laser power attenuators for a certain wavelength range.

Standard products

MATERIAL	DIMENSIONS	WAVELENGTH RANGE	REFLECTANCE	AOI	SKU	PRICE	
UVFS	$\varnothing 25,4 \times 5$ mm	770-830 nm	50% \pm 3%	0-5°	6522	Request	
			75% \pm 3%	0-5°	6523	Request	
			90% \pm 3%	0-5°	6524	Request	
			95% \pm 2%	0-5°	6525	Request	
			97% \pm 1%	0-5°	6444	Request	
			99% \pm 0,5%	0-5°	6526	Request	
		1020-1070 nm	50% \pm 3%	0-5°	6527	95 €	
			75% \pm 3%	0-5°	6528	95 €	
			90% \pm 3%	0-5°	6529	95 €	
			95% \pm 2%	0-5°	6530	95 €	
			97% \pm 1%	0-5°	6531	95 €	
			99% \pm 0,5%	0-5°	6532	95 €	
			1520-1570 nm	50% \pm 3%	0-5°	6533	115 €
				75% \pm 3%	0-5°	6534	115 €
				90% \pm 3%	0-5°	6535	115 €
				95% \pm 2%	0-5°	6536	115 €
				97% \pm 1%	0-5°	6537	115 €
				99% \pm 0,5%	0-5°	6538	115 €



Low GDD ultrafast mirrors

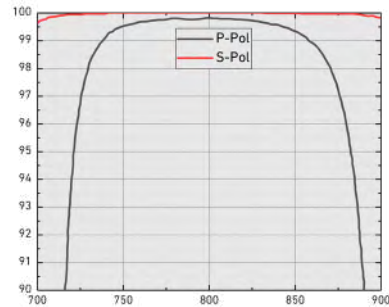
Main features

- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- Coating stack is designed to have low dispersion (GDD) for the reflected wavelengths
- 0° or 45° angle of incidence selection
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- High reflectivity mirrors for tunable and broadband ultrashort laser sources
- Broadband light beam steering and folding

Low GDD Ultrafast mirrors are designed for high power ultrashort (femtosecond) laser pulse applications to provide both maximized high reflectivity and minimized low GDD value at the same time. Such coatings are used for internal and external beam manipulation applications where pulse broadening effect is undesirable. Our Low GDD Ultrafast mirrors are intended for Ti:Sapphire, Nd:Glass or Ytterbium doped host based lasers working in femtosecond regimes.



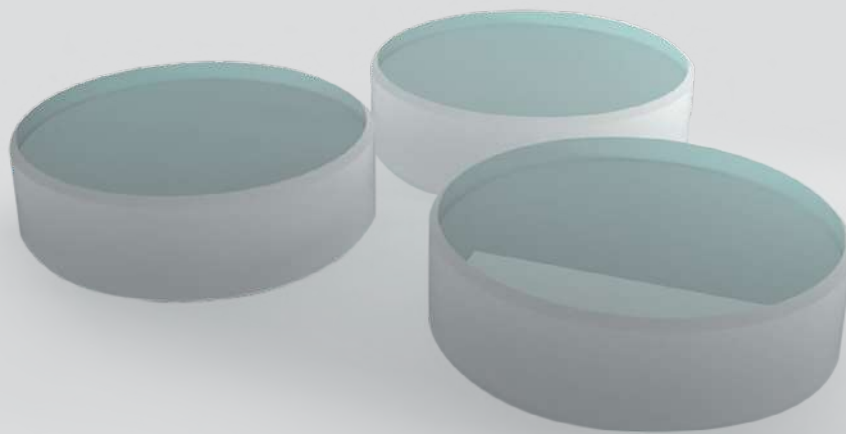
Standard specifications

LOW GDD ULTRAFAST MIRRORS	
Substrate material	UV grade fused silica
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	$\pm 0,25$ mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/8$ @632,8 nm
Group delay dispersion	<100 fs ² @ 750-850nm
Laser induced damage threshold	>2 J/cm ² @800 nm, 200 ps (for 730-870 nm mirrors)

Standard products

MATERIAL	FACE DIMENSIONS	THICKNESS	COATING S1	AOI	SKU	PRICE
UVFS	$\varnothing 50,8$ mm	6,35 mm	HR(Rs>99,5%@710-890 nm; Rp>98,5%@740-860 nm)	45 deg.	18689	145 €
			HR(R>99,5%@730-870 nm)	0 deg.	18796	145 €
	$\varnothing 25,4$ mm	5 mm	HR(R>99,5%@730-870 nm)	0 deg.	28437	76 €
			HR(Rs>99,5%@710-890 nm; Rp>98,5%@740-860 nm)	45 deg.	9531	76 €

Wavelength separators and combiners



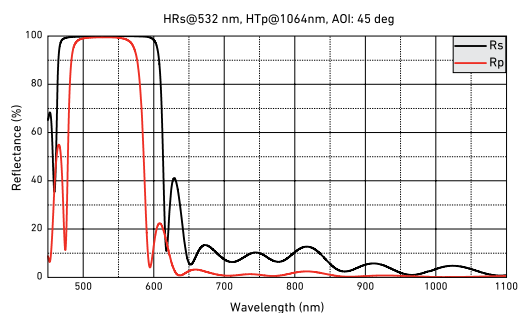
Main features

- Substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- 0° or 45° angle of incidence selection
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- Laser separation of the laser fundamental wavelength and its harmonics
- Laser beam combining
- Laser resonator pump (rear) mirror

Wavelength separators and combiners provide spatial separation or combination of different spectral components. These optical elements feature highly reflective dielectric coatings on the front side and antireflective dielectric coatings for transmissive spectral components on the rear side of UV grade fused silica substrates.

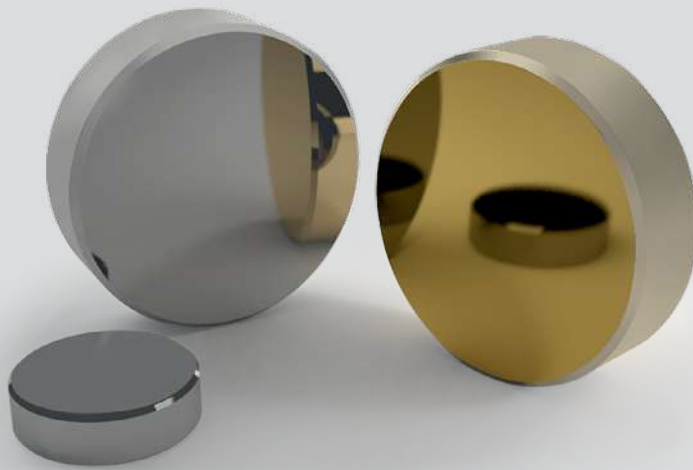


Standard specifications

WAVELENGTH SEPARATORS AND COMBINERS	
Substrate material	UV grade fused silica
Clear aperture	>85%
Face dimensions tolerance	+0/-0.15 mm
Thickness tolerance	$\pm 0,25$ mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/8$ @632,8 nm
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns (for 1020 nm - 1070 nm reflecting separator)

Standard products

MATERIAL	DIMENSIONS	REFLECTED WAVELENGTH RANGE	TRANSMITTED WAVELENGTH RANGE	AOI	SKU	PRICE
UVFS	$\varnothing 25,4 \times 5$ mm	R>99,5%@254-266 nm	T>90%@340-355 nm + 510-535 nm + 1020-1070 nm	0°	6359	88 €
		R>99,5%@340-355 nm	T>93%@510-535 nm + 1020-1070 nm	0°	6544	74 €
		R>99,5%@385-415 nm	T>95%@770-830 nm	0°	6545	74 €
		R>99,5%@510-535 nm	T>95%@1020-1070 nm	0°	6546	74 €
		R>99,5%@770-830 nm	T>95%@385-415 nm	0°	6548	74 €
		R>99,5%@770-830 nm	T>95%@510-535 nm	0°	6547	74 €
		R>99,5%@1020-1070 nm	T>95%@510-535 nm	0°	6549	74 €
		R>99,5%@1020-1070 nm	T>95%@800-810 nm	0°	6550	74 €
		R>99,5%@1020-1070 nm	T>95%@940-980 nm	0°	6551	195 €
		R>99,5%@1520-1570 nm	T>95%@940-980 nm	0°	6552	90 €
		R>99,5%@1890-1990 nm	T>95%@780-820 nm	0°	6553	98 €
		R>99,5%@2000-2100 nm	T>95%@780-820 nm	0°	6554	110 €
		Rs>99,5%, Rp>98,5%@254-266 nm	Ts>85%, Tp>95%@340-355 nm + 510-535 nm + 1020-1070 nm	45°	6555	88 €
		Rs>99,6%, Rp>99,2%@340-355 nm	Ts>91%, Tp>95%@510-535 nm + 1020-1070 nm	45°	6556	74 €
		Rs>99,6%, Rp>99,2%@385-415 nm	Ts>93%, Tp>97%@770-830 nm	45°	6557	74 €
		Rs>99,6%, Rp>99,2%@510-535 nm	Ts>93%, Tp>97%@1020-1070 nm	45°	6558	74 €
		Rs>99,6%, Rp>99,2%@770-830 nm	Ts>93%, Tp>97%@385-415 nm	45°	6560	74 €
		Rs>99,6%, Rp>99,2%@770-830 nm	Ts>93%, Tp>97%@510-535 nm	45°	6559	74 €
		Rs>99,6%, Rp>99,2%@1020-1070 nm	Ts>93%, Tp>97%@510-535 nm	45°	6561	74 €
		Rs>99,6%, Rp>99,2%@1020-1070 nm	Ts>93%, Tp>97%@800-810 nm	45°	6562	74 €
Rs>99,6%, Rp>99,2%@1020-1070 nm	Ts>93%, Tp>97%@940-980 nm	45°	6563	195 €		
Rs>99,6%, Rp>99,2%@1520-1570 nm	Ts>93%, Tp>97%@940-980 nm	45°	6564	90 €		
Rs>99,6%, Rp>99,2%@1890-1990 nm	Ts>93%, Tp>97%@780-820 nm	45°	6565	98 €		
Rs>99,6%, Rp>99,2%@2000-2100 nm	Ts>93%, Tp>97%@780-820 nm	45°	6566	110 €		



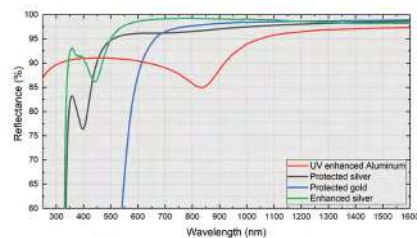
Flat and curved metal-coated mirrors

Main features

- Mirror substrates fabricated from high-quality UV grade fused silica
- Standard substrate dimensions are $\varnothing 25,4 \times 5$ mm
- UV enhanced aluminum, protected aluminum, protected silver, low GDD enhanced silver and protected gold metallic coatings selection
- Relatively uniform reflectance over a wide wavelength range
- Radius of curvature selection from infinity to -200 mm
- Custom metal-coated mirrors available upon request

Application examples

- Broadband reflectivity and low chromatic dispersion mirrors for white-light interferometers and broadband laser sources
- Partially transmissive broadband mirrors
- Extremely long infrared (up to 20 μm) mirrors
- Plano-convex and plano-concave designs



Metal-coated mirrors exhibit a relatively uniform reflectivity over wide wavelength range. They are nearly insensitive to angle of incidence and polarization state of light, thus their reflection losses are significantly higher compared to dielectric thin-film mirrors.

Standard specifications

FLAT AND CURVED METAL-COATED MIRRORS	
Substrate material	UV grade fused silica
Substrate dimensions	$\varnothing 25,4 \times 5$ mm
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	± 1 mm
Protective chamfers	<0,35 mm at 45°
Parallelism error	<3 arcmin for plano-plano mirrors
Surface quality	40-20 5-D
Surface flatness	$< \lambda/8 @ 632,8$ nm
Laser induced damage threshold	>0,25 J/cm ² @1064 nm, 11 ns for protected aluminum mirrors, >1,8 J/cm ² @1064 nm, 11 ns for protected silver mirrors and for enhanced silver mirrors, >0,9 J/cm ² @1064 nm, 11 ns for protected gold mirrors

Standard products

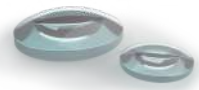
MATERIAL	DIMENSIONS	COATINGS	AVERAGE REFLECTANCE	TYPE	ROC	SKU	PRICE
UVFS	$\varnothing 25,4 \times 5$ mm	UV enhanced Aluminum	>80%@230-700 nm	Plano-plano	Infinity	6343	40 €
				Plano-concave	-50 mm	6345	60 €
				Plano-concave	-100 mm	6344	60 €
				Plano-plano	-200 mm	6346	60 €
		Protected Aluminum	>85%@300 nm-IR	Plano-plano	Infinity	6355	32 €
				Plano-concave	-50 mm	6356	54 €
				Plano-concave	-100 mm	6357	54 €
				Plano-concave	-200 mm	6358	54 €
		Protected Silver	>96%@400 nm-IR	Plano-plano	Infinity	6347	40 €
				Plano-concave	-50 mm	6348	60 €
				Plano-concave	-100 mm	6349	60 €
				Plano-concave	-200 mm	6354	60 €
		Enhanced Silver	>99%@700-900 nm	Plano-plano	Infinity	15197	78 €
				Plano-plano	Infinity	6350	44 €
		Protected Gold	>96%@900 nm-IR	Plano-concave	-50 mm	6351	70 €
				Plano-concave	-100 mm	6352	70 €
Plano-concave	-200 mm			6353	70 €		



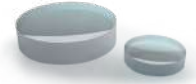
Optogama provide a variety of spherical, cylindrical and conical lenses fabricated from BK7 and UVFS glasses for UV, VIS and NIR applications. Standard lenses are uncoated, although anti-reflective coatings are available upon request as well as custom solutions.

Lenso

es



Plano-convex spherical lenses



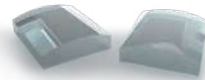
Plano-concave spherical lenses



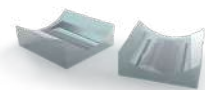
Bi-convex spherical lenses



Bi-concave spherical lenses



Plano-convex cylindrical lenses

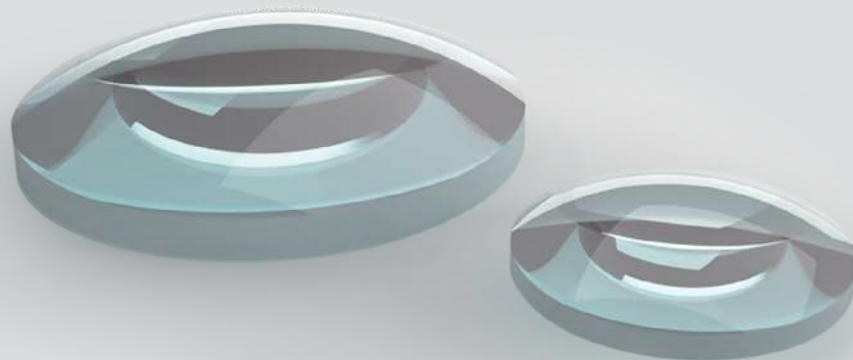


Plano-concave cylindrical lenses



Axicons (conical lenses)

Plano-convex spherical lenses



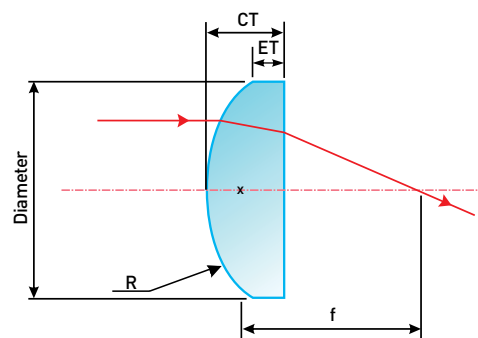
Main features

- Fabricated from high-quality UV grade fused silica and BK7 glasses
- Standard diameters are $\varnothing 12,7$ mm and $\varnothing 25,4$ mm
- Focal length selection from 20 mm to 10 000 mm
- Antireflective coatings, custom substrate material, dimensions, and focal lengths available upon request

Application examples

- Focusing a collimated beam
- Collimating beam from a point source
- Beam expanders and collimators

Plano-convex spherical lenses have one plano and one spherical convex surface, while their focal lengths are positive. These lenses provide the best performance when used for 5X to infinite-conjugate ratio applications, e.g. focusing a collimated light beam or collimating beam from a point source.



Standard specifications

PLANO-CONVEX LENSES	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 lenses: 350 nm - 2 μ m Uncoated UVFS lenses: 185 nm - 2,1 μ m
Clear aperture	>90%
Diameter tolerance	+0/-0,1 mm
Edge thickness	2 mm
Thickness tolerance	$\pm 0,5$ mm
Centration error	<3 arcmin
Focal length tolerance	$\pm 3\%$ @632,8 nm
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface irregularity	$\leq \lambda/8$ @632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	DIAMETER	FOCAL LENGTH	SKU	PRICE
BK7	ø12,7 mm	20 mm	7014	15 €
		40 mm	7015	15 €
		50 mm	7016	15 €
		75 mm	7017	15 €
		100 mm	7018	15 €
		150 mm	7019	15 €
		200 mm	7020	15 €
		250 mm	7021	15 €
		300 mm	7022	15 €
		350 mm	7023	15 €
		500 mm	7024	15 €
		1000 mm	7025	15 €
		1500 mm	7026	15 €
		ø25,4 mm	30 mm	7134
	40 mm		7135	19 €
	50 mm		7136	19 €
	60 mm		7137	19 €
	75 mm		7138	19 €
	100 mm		7141	19 €
	125 mm		7142	19 €
	150 mm		7143	19 €
	175 mm		7144	19 €
	200 mm		7145	19 €
	250 mm		7146	19 €
	300 mm		7147	19 €
	400 mm	7148	19 €	
500 mm	7149	19 €		
700 mm	7150	19 €		
1000 mm	7151	19 €		
1500 mm	7152	19 €		
2000 mm	7153	19 €		
3000 mm	7154	19 €		
4000 mm	7155	19 €		
5000 mm	7156	19 €		
2500 mm	7157	19 €		
10000 mm	7158	19 €		

MATERIAL	DIAMETER	FOCAL LENGTH	SKU	PRICE
UVFS	ø12,7 mm	20 mm	7118	32 €
		40 mm	7119	32 €
		50 mm	7120	32 €
		75 mm	7121	32 €
		100 mm	7122	32 €
		150 mm	7123	32 €
		200 mm	7124	32 €
		250 mm	32218	32 €
		300 mm	7125	32 €
		350 mm	32219	32 €
		400 mm	7126	32 €
		500 mm	7127	32 €
		700 mm	7128	32 €
		1000 mm	7129	32 €
	1500 mm	7130	32 €	
	ø25,4 mm	30 mm	7159	38 €
		40 mm	7160	38 €
		50 mm	7161	38 €
		60 mm	7162	38 €
		75 mm	7163	38 €
		100 mm	7166	38 €
		125 mm	7167	38 €
		150 mm	7168	38 €
		175 mm	7169	38 €
		200 mm	7170	38 €
		250 mm	7171	38 €
300 mm		7172	38 €	
400 mm	7173	38 €		
500 mm	7174	38 €		
750 mm	7175	38 €		
1000 mm	7176	38 €		
1500 mm	7177	38 €		
2000 mm	7178	38 €		
3000 mm	7179	38 €		
4000 mm	7180	38 €		
5000 mm	7181	38 €		
7000 mm	7182	38 €		
10000 mm	7183	38 €		
ø50,8 mm	200 mm	32220	135 €	
	300 mm	32221	135 €	
	500 mm	32222	135 €	
	1000 mm	32223	135 €	
2000 mm	32224	135 €		

Plano-concave spherical lenses

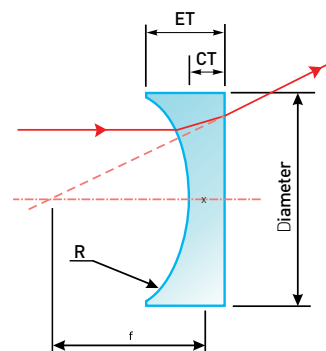
Main features

- Fabricated from high-quality UV grade fused silica and BK7 glasses
- Standard diameters are $\varnothing 12,7$ mm and $\varnothing 25,4$ mm
- Focal length selection from -20 mm to -10000 mm
- Antireflective coatings, custom substrate material, dimensions, and focal lengths available upon request

Application examples

- Collimating a convergent beam
- Diverging a collimated beam
- Relay imaging

Plano-concave spherical lenses have one plano and one spherical concave surface, while their focal lengths are negative. These lenses provide the best performance when used for 5X to infinite-conjugate ratio applications, e.g. collimating a convergent beam, diverging a collimated beam. To prevent spherical aberrations collimated beam should always be incident on curved lens surface and vice versa.



Standard specifications

PLANO-CONCAVE LENSES	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 lenses: 350 nm - 2 μ m Uncoated UVFS lenses: 185 nm - 2,1 μ m
Clear aperture	>90%
Diameter tolerance	+0/-0,1 mm
Edge thickness	2 mm
Thickness tolerance	$\pm 0,5$ mm
Centration error	<3 arcmin
Focal length tolerance	$\pm 3\%$ @632,8 nm
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface irregularity	$\leq \lambda/8$ @632,8 nm
Coatings	Uncoated, available upon request

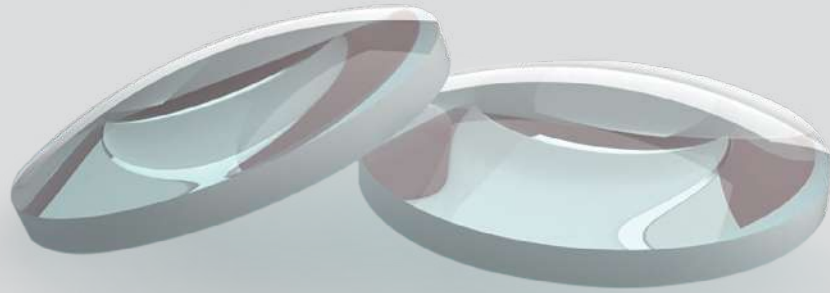
Standard products

MATERIAL	DIAMETER	FOCAL LENGTH	SKU	PRICE	
BK7	ø12,7 mm	-25 mm	7507	15 €	
		-50 mm	7508	15 €	
		-60 mm	7509	15 €	
		-75 mm	7510	15 €	
		-100 mm	7511	15 €	
		-150 mm	7512	15 €	
		-200 mm	7513	15 €	
		-250 mm	7514	15 €	
		-300 mm	7515	15 €	
		-30 mm	7525	19 €	
	-40 mm	7543	19 €		
	-50 mm	7526	19 €		
	-75 mm	7527	19 €		
	-100 mm	7528	19 €		
	-125 mm	7544	19 €		
	-150 mm	7545	19 €		
	-200 mm	7529	19 €		
	-250 mm	7546	19 €		
	-300 mm	7530	19 €		
	-400 mm	7531	19 €		
	-500 mm	7532	19 €		
	-750 mm	7547	19 €		
	-1000 mm	7533	19 €		
	-1500 mm	7549	19 €		
	-2000 mm	7548	19 €		
	-3000 mm	7550	19 €		
	-5000 mm	7551	19 €		
		ø25,4 mm			

Standard products

MATERIAL	DIAMETER	FOCAL LENGTH	SKU	PRICE	
UVFS	ø12,7 mm	-20 mm	7516	32 €	
		-50 mm	7518	32 €	
		-100 mm	7519	32 €	
		-200 mm	7520	32 €	
		-300 mm	7521	32 €	
		-400 mm	7522	32 €	
		-500 mm	7523	32 €	
		-1000 mm	7524	32 €	
		-30 mm	7534	38 €	
		-40 mm	7553	38 €	
	-50 mm	7535	38 €		
	-60 mm	7554	38 €		
	-70 mm	7555	38 €		
	-80 mm	7556	38 €		
	-90 mm	7557	38 €		
	-100 mm	7537	38 €		
	-150 mm	7558	38 €		
	-200 mm	7538	38 €		
	-300 mm	7539	38 €		
	-400 mm	7540	38 €		
	-500 mm	7541	38 €		
	-700 mm	7559	38 €		
	-1000 mm	7542	38 €		
	-2000 mm	7536	38 €		
	-3000 mm	7560	38 €		
	-5000 mm	7561	38 €		
	-10000 mm	7562	38 €		
		ø25,4 mm			
	-250 mm		32269	135 €	
	-300 mm		32271	135 €	
-500 mm	32272		135 €		
-1000 mm	32274		135 €		
-2000 mm	32275		135 €		
	ø50,8 mm				
-500 mm			32272	135 €	
-1000 mm			32274	135 €	
-2000 mm			32275	135 €	

Bi-convex spherical lenses



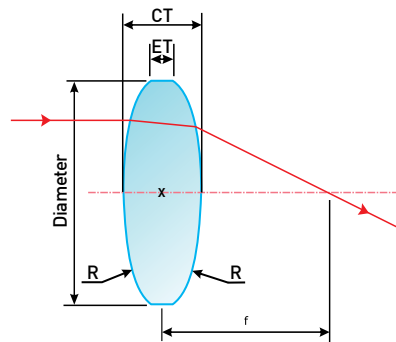
Main features

- Fabricated from high-quality UV grade fused silica and BK7 glasses
- Standard diameter is $\varnothing 25,4$ mm
- Focal length selection from 25 mm to 100 mm
- Antireflective coatings, custom substrate material, dimensions, and focal lengths available upon request

Application examples

- Finite-conjugate imaging
- Beam relay applications
- Beam expanders

Bi-convex spherical lenses feature two convex surfaces with the same radius of curvature, while their focal length is positive. These lenses perform the best at finite conjugate (0,2X - 5X ratio) applications. At 1:1 conjugate ratio spherical aberrations, coma and distortion are minimized.

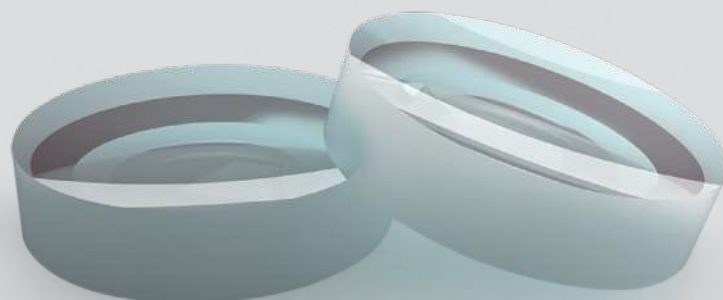


Standard specifications

BI-CONVEX SPHERICAL LENSES	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 lenses: 350 nm - 2 μ m Uncoated UVFS lenses: 185 nm - 2,1 μ m
Clear aperture	>90%
Diameter tolerance	+0/-0,1 mm
Edge thickness	2 mm
Thickness tolerance	$\pm 0,5$ mm
Centration error	<3 arcmin
Focal length tolerance	$\pm 3\%$ @632,8 nm
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface irregularity	$\leq N/8$ @632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	DIAMETER	FOCAL LENGTH	SKU	PRICE
BK7	$\varnothing 25,4$ mm	25 mm	7569	28 €
		50 mm	7570	28 €
		75 mm	7571	28 €
		100 mm	7572	28 €
UVFS	$\varnothing 25,4$ mm	25 mm	7565	72 €
		50 mm	7566	72 €
		75 mm	7567	72 €
		100 mm	7568	72 €



Bi-concave spherical lenses

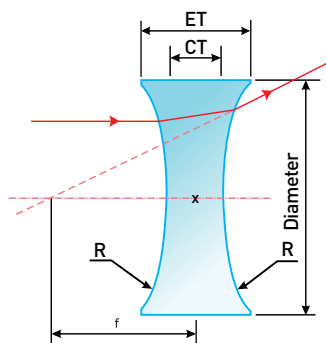
Main features

- Fabricated from high-quality UV grade fused silica, BK7 glasses
- Standard diameter is $\varnothing 25,4$ mm
- Focal length selection from -25 mm to -100 mm
- Antireflective coating, custom substrate material, dimensions, and focal lengths available upon request

Application examples

- Beam expanders
- Relay imaging

Bi-concave spherical lenses feature two spherical concave surfaces with the same radius of curvature, while their focal length is negative. The performance of these lenses is best when used for finite conjugate (0,2X - 5X ratio) applications, most often to diverge converging light.

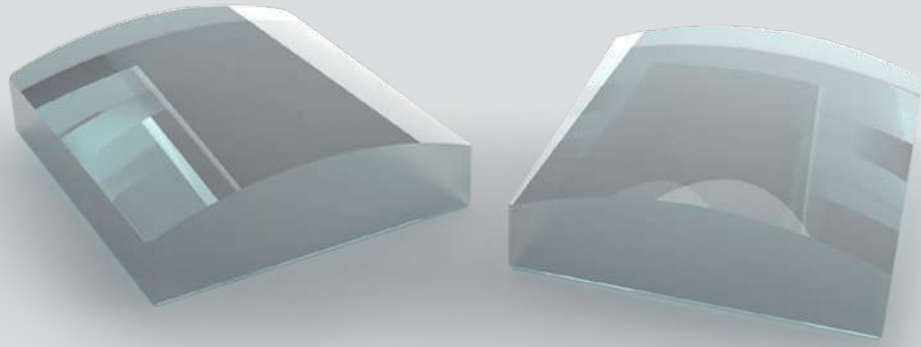


Standard specifications

BI-CONCAVE SPHERICAL LENSES	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 lenses: 350 nm - 2 μ m Uncoated UVFS lenses: 185 nm - 2,1 μ m
Clear aperture	>90%
Diameter tolerance	+0/-0,1 mm
Center thickness	2 mm
Thickness tolerance	$\pm 0,5$ mm
Centration error	<3 arcmin
Focal length tolerance	$\pm 3\%$ @632,8 nm
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface irregularity	$\leq \lambda/8$ @632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	DIAMETER	FOCAL LENGTH	SKU	PRICE
BK7	$\varnothing 25,4$ mm	-25 mm	7576	28 €
		-50 mm	7577	28 €
		-75 mm	7578	28 €
		-100 mm	7579	28 €
UVFS	$\varnothing 25,4$ mm	-25 mm	7580	72 €
		-50 mm	7573	72 €
		-75 mm	7574	72 €
		-100 mm	7575	72 €



Plano-convex cylindrical lenses

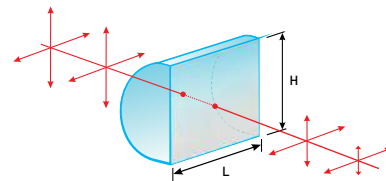
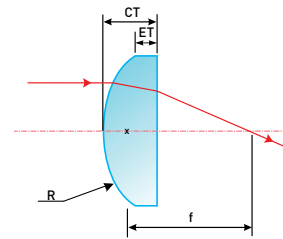
Main features

- Fabricated from high-quality UV grade fused silica, BK7 glasses
- Standard face dimensions are 25,4 x 25,4 mm and 25,4 x 50,8 mm
- Focal length selection from 50 mm to 10000 mm
- Antireflective coatings, custom substrate material, dimensions, and focal lengths available upon request

Application examples

- Coupling into a slit or linear shape detectors
- Anamorphic beam shaping
- Astigmatism correction of laser diode beam

Plano-convex cylindrical lenses feature single plano and single convex cylindrical surface, while their focal length is positive. These lenses operate only in one dimension rather than two, compared to plano-convex spherical lenses. Plano-convex cylindrical lenses provide the best performance at the same operating conditions as plano-convex spherical lenses: from 5X to finite-conjugate ratio.

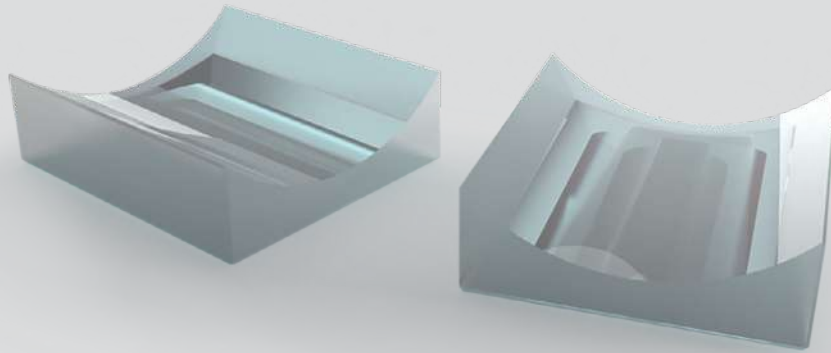


Standard specifications

PLANO-CONVEX CYLINDRICAL LENSES	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 lenses: 350 nm - 2 μm Uncoated UVFS lenses: 185 nm - 2,1 μm
Clear aperture	>90%
Diameter tolerance	+0/-0,1 mm
Edge thickness	2 mm
Thickness tolerance	±0,5 mm
Centration error	<3 arcmin
Focal length tolerance	±3%@632,8 nm
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface irregularity	≤N/4@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	FACE DIMENSIONS H X L	FOCAL LENGTH	SKU	PRICE
BK7	25,4 x 25,4 mm	50 mm	7596	Request
		75 mm	7598	Request
		150 mm	7603	Request
		200 mm	7604	Request
		250 mm	7605	Request
		300 mm	7606	Request
	25,4 x 50,8 mm	500 mm	7609	Request
		100 mm	7600	Request
		300 mm	7607	Request
		500 mm	7610	Request
		750 mm	7611	Request
		2000 mm	7612	Request
	25,4 x 25,4 mm	10000 mm	7613	Request
		50 mm	7587	Request
		75 mm	7589	Request
		30 mm	7582	Request
		50 mm	7583	Request
		75 mm	7584	Request
UVFS	25,4 x 50,8 mm	100 mm	7585	Request
		150 mm	7586	Request
	25,4 x 50,8 mm	200 mm	7588	Request
		250 mm	7590	Request
		300 mm	7591	Request
		400 mm	7592	Request
		500 mm	7593	Request
		750 mm	7594	Request
		1000 mm	7595	Request



Plano-concave cylindrical lenses

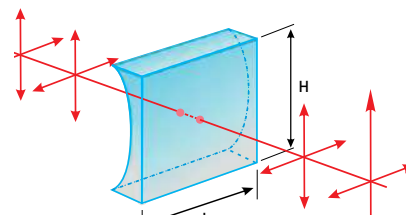
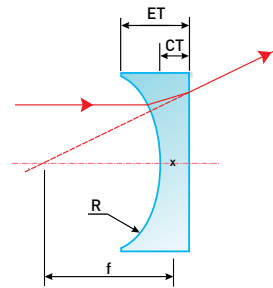
Main features

- Fabricated from high-quality UV grade fused silica, BK7 glasses
- Standard face dimensions are 25,4 x 25,4 mm and 25,4 x 50,8 mm
- Focal length selection from -25 mm to -1000 mm
- Antireflective coating, custom substrate material, dimensions, and focal lengths available upon request

Application examples

- Anamorphic beam shaping
- Laser projection
- Laser scanning

Plano-concave cylindrical lenses feature single plano, single concave cylindrical surface and negative focal length. These lenses are similar to plano-concave spherical lenses, though the difference is that they operate only in a single dimension rather than two symmetrical dimensions. Applicable conditions for optimal performance are the same as for plano-concave lenses: from 5X to infinite-conjugate ratio.



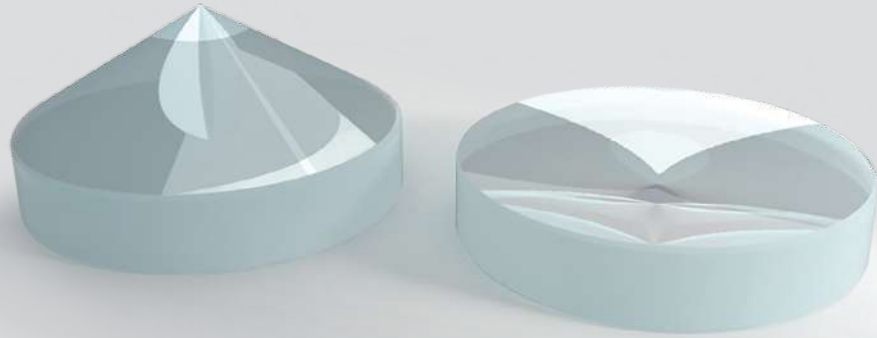
Standard specifications

PLANO-CONVEX CYLINDRICAL LENSES	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 lenses: 350 nm - 2 μm Uncoated UVFS lenses: 185 nm - 2,1 μm
Clear aperture	>90%
Diameter tolerance	+0/-0,1 mm
Center thickness	2 mm
Thickness tolerance	±0,5 mm
Centration error	<3 arcmin
Focal length tolerance	±3%@632,8 nm
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface irregularity	≤λ/4@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	FACE DIMENSIONS H X L	FOCAL LENGTH	SKU	PRICE
BK7	25,4 x 25,4 mm	-50mm	7621	Request
		-75 mm	7622	Request
		-100 mm	7625	Request
		-200 mm	7626	Request
	25,4 x 50,8 mm	-500 mm	7628	Request
		-50mm	7623	Request
		-75 mm	7624	Request
		-200 mm	7631	Request
		-500 mm	7627	Request
		-25 mm	7614	Request
UVFS	25,4 x 25,4 mm	-50 mm	7629	Request
		-50 mm	7630	Request
		-100 mm	7615	Request
		-200 mm	7616	Request
	25,4 x 50,8 mm	-300 mm	7617	Request
		-400 mm	7618	Request
		-500 mm	7619	Request
		-1000 mm	7620	Request

Axicons (conical lenses)



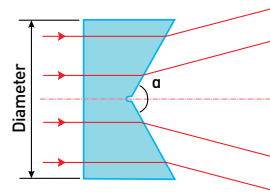
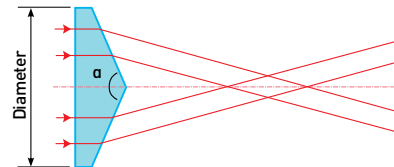
Main features

- Fabricated from high-quality UV grade fused silica, BK7 glasses
- Plano-convex and plano-concave designs
- Regular and advanced grade axicons
- Wide axicon apex angle selection
- Antireflective coatings, customization available upon request

Application examples

- Corneal surgery
- Optical coherence tomography
- Atom trapping

Axicons (conical lenses) are famous for their ability to transform a collimated Gaussian beam into an approximation of non-diffracting Bessel beam in the near-field and ring-shaped beam in the far-field. Most often they are used in tandem with other types of lenses. Optogama provide plano-convex and plano-concave types of conical lenses. These lenses feature one convex surface or one concave conical surface, respectively, while second surface is plano in both cases.



Standard specifications

AXICONS		
Type	Plano-convex	Plano-concave
Substrate material	BK7, UVFS	UVFS
Wavelength range	Uncoated BK7 axicons: 350 nm - 2 μm Uncoated UVFS axicons: 185 nm - 2,1 μm	
Clear aperture	>90%	>90%
Diameter tolerance	+0/-0,1 mm	+0/-0,1 mm
Apex rounding	Regular: $\leq 0,1$ mm Advanced: $\leq 0,4$ mm	N/A
Angle tolerance	Regular: $\pm 0,5^\circ$ Advanced: $\pm 0,1^\circ$	Regular: $\pm 0,5^\circ$
Central hole	N/A	Regular: $\sim 0,1$ mm, depth ~ 2 mm
Protective chamfers	<math>< 0,35</math> mm at 45°	<math>< 0,35</math> mm at 45°
Surface quality	Regular: 60-40 S-D Advanced: 40-20 S-D	Regular: 60-40 S-D
Surface irregularity	Regular: $< 1\lambda@632,8$ nm Advanced: $< \lambda/4@632,8$ nm	Regular: $< 1\lambda@632,8$ nm
Coatings	Uncoated	Uncoated

Standard products

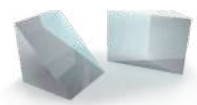
MATERIAL	SHAPE	GRADE	DIAMETER	APEX ANGLE	SKU	PRICE				
BK7	Plano-convex	Regular	$\varnothing 25,4$ mm	140°	7640	160 €				
				160°	7641	160 €				
				170°	7642	160 €				
				175°	7643	160 €				
				178°	7644	160 €				
				130°	7632	360 €				
				140°	7633	360 €				
				160°	7634	360 €				
				170°	7635	360 €				
				175°	7636	360 €				
UVFS	Plano-convex	Advanced	$\varnothing 25,4$ mm	176°	7637	360 €				
				178°	7638	360 €				
				179°	7639	360 €				
				140°	7645	480 €				
				160°	7646	480 €				
				170°	7647	480 €				
				175°	7648	480 €				
				179°	7649	480 €				
				UVFS	Plano-concave	Regular	$\varnothing 25,4$ mm	170°	7647	480 €
								175°	7648	480 €



Optogama provide uncoated and unmounted dispersing prisms, HR right-angle retroreflectors, corner cube retroreflectors and penta prisms for UV, VIS and NIR applications. Applications of these prisms include beam bending, folding, retroreflecting, optical alignment and more. Since most of the prisms are initially uncoated, we recommend applying the appropriate coatings to optimize the performance. Metallic and dielectric thin-film coatings are available upon demand.

Prism

ns



Dispersing prisms



Right-angle prisms



Corner cube
retroreflectors



Penta prisms



HR right-angle
retroreflectors

Dispersing prisms

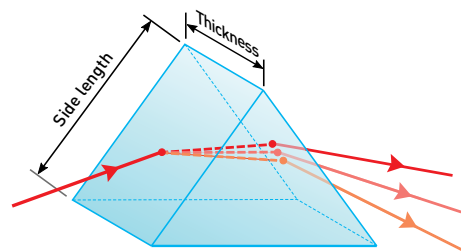
Main features

- Fabricated from high-quality UV fused silica, BK7, SF11 glasses
- Input and output faces are optically polished (refer to the drawing)
- Small losses for p-polarized light
- Group delay dispersion adjustment of ultrashort pulses
- Antireflective coatings, custom design, substrate material and dimensions available upon request

Application examples

- Compression of ultrashort laser pulses
- Dispersion compensation in mode-locked lasers
- Spatial separations of different spectral components

Optogama standard uncoated isosceles dispersing prisms are fabricated from UVFS, BK7, SF11 optical glasses and offer different dispersive properties. Used in both intra- and extra-cavity setups for ultrashort laser pulse temporal manipulation. Their construction enables to use them at Brewster angle, therefore p-polarized light losses are extremely low.

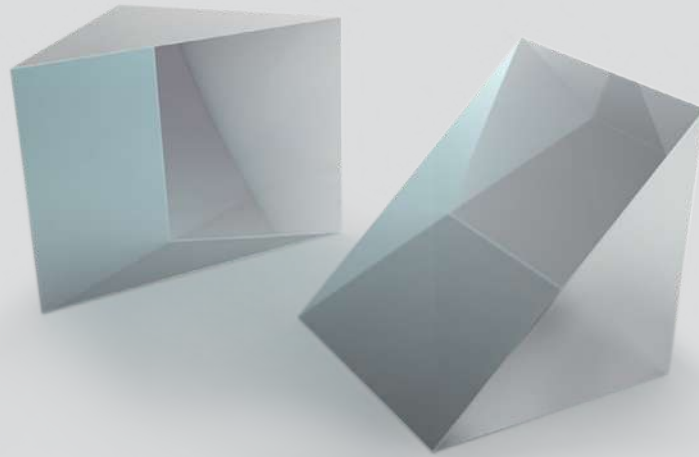


Standard specifications

DISPERSING PRISMS	
Substrate material	BK7, SF11, UVFS
Wavelength range	Uncoated BK7 prisms: 350 nm - 2 μm Uncoated UVFS prisms: 185 nm - 2,1 μm Uncoated SF11 prisms: 420 nm - 2,3 μm
Design wavelength	800 nm
Clear aperture	80% of face and length width
Dimensions tolerance	±0,25 mm
Angle tolerance	±2 arcmin
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface flatness	≤λ/4@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	APEX ANGLE	THICKNESS	SIDE LENGTH	MAX INPUT BEAM DIAMETER	SKU	PRICE
SF11	59°	10 mm	15 mm	6 mm	6617	49 €
		18 mm	25 mm	12 mm	6622	95 €
		25 mm	50 mm	22 mm	6623	195 €
BK7	67°	10 mm	15 mm	6 mm	6615	40 €
		18 mm	25 mm	12 mm	6618	69 €
		25 mm	50 mm	22 mm	6619	140 €
UVFS	69°	10 mm	15 mm	6 mm	6616	72 €
		18 mm	25 mm	12 mm	6620	125 €
		25 mm	50 mm	22 mm	6621	260 €



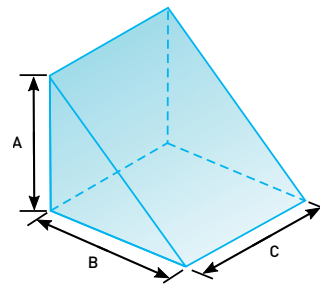
Right-angle prisms

Main features

- Fabricated from high-quality UV grade fused silica, BK7
- Rectangular faces are optically polished
- Standard and advanced grade selection
- Metallic and dielectric thin-film coatings, custom substrate material and dimensions are available upon request

Application examples

- 90° internal or external mirror
- Retroreflector
- Components for cube beamsplitter



Optogama standard uncoated right-angle (45°-90°-45°) design prisms are fabricated from UVFS and BK7 optical glasses and have three optically polished rectangular surfaces (refer to the drawing). These prisms are popular at 90° internal or external beam bending, 180° beam folding, image rotation. These applications are based on the total internal reflection at glass-air boundary inside the prism, except 90° external beam bending, which requires metallic or highly reflective dielectric thin film to be applied onto the hypotenuse face. Antireflective coatings have to be applied in order to optimize the optical transmission for a particular application. Contact us for coating service, custom solutions, and pricing.

Standard specifications

RIGHT-ANGLE PRISMS	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 prisms: 350 nm - 2 μm Uncoated UVFS prisms: 185 nm - 2.1 μm
Clear aperture	≥80% of face dimensions
Dimensions tolerance	+0/-0,25 mm
90° angle tolerance	Regular grade: ±2 arcmin Advanced grade: ±5 arcsec
Pyramidal tolerance	Regular grade: ±1 arcmin Advanced grade: ±30 arcsec
Protective chamfers	<0,25 mm at 45°
Surface quality	40-20 S-D
Surface flatness	≤λ/4@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	DIMENSIONS A = B = C	GRADE	SKU	PRICE
BK7	5 mm	Regular	6570	18 €
		Advanced	6571	20 €
	10 mm	Regular	6572	42 €
		Advanced	6573	31 €
	20 mm	Regular	6574	57 €
		Advanced	6576	45 €
UVFS	5 mm	Regular	6575	49 €
		Advanced	6567	93 €
	10 mm	Regular	6568	59 €
		Advanced	6569	116 €
	20 mm	Regular	6568	59 €
		Advanced	6569	116 €

Corner cube retroreflectors

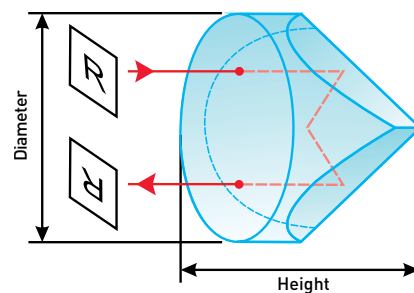
Main features

- Fabricated from high-quality UV grade fused silica, BK7 optical glasses
- Provides high-precision angle insensitive retroreflection ($180^\circ \pm 30$ arcsec)
- Inverts and reverses the image
- Antireflective coatings, custom material and dimensions available upon request

Application examples

- Beam alignment
- Retroreflectors

Optogama standard uncoated corner cube retroreflectors are fabricated from high-quality UVFS and BK7 optical glasses. Corner cube retroreflector prisms provide the beam deviation by 180° and creates an inverted, reversed image independent of the angle of incidence, with a wide incident angle acceptance range. Operating principle is based on three total internal reflections inside the prism. Antireflective coatings have to be applied in order to optimize the optical transmission for a particular application. Contact us for coating service, custom solutions and pricing.

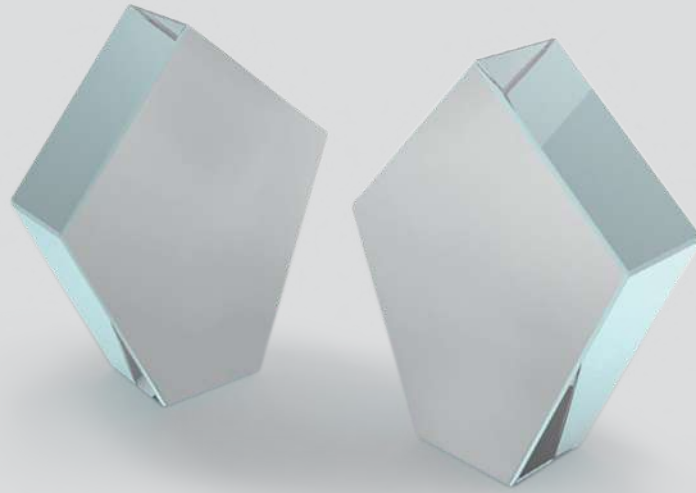


Standard specifications

CORNER CUBE RETROREFLECTORS	
Substrate material	BK7, UVFS
Beam deviation	$180^\circ \pm 30$ arcsec
Wavelength range	Uncoated BK7 retroreflectors: 350 nm - 2 μ m Uncoated UVFS retroreflectors: 185 nm - 2,1 μ m
Clear aperture	>80% of face dimensions
Dimensions tolerance	+0/-0,3 mm
Angle tolerance	± 5 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface flatness	<A/4@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	DIAMETER	HEIGHT	SKU	PRICE
BK7	$\varnothing 25,4$ mm	17,5 mm	7564	140 €
UVFS	$\varnothing 25,4$ mm	17,5 mm	7563	185 €



Penta prisms

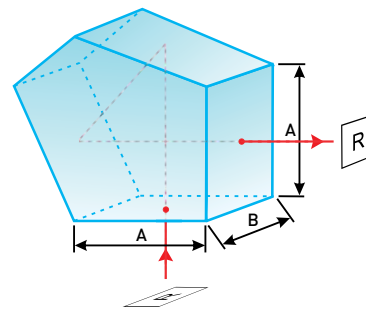
Main features

- Fabricated from high-quality BK7 glass
- $90^\circ \pm 1$ arcmin deviation
- Does not invert, reverse beam or image
- $< \lambda/10 @ 632,8$ nm surface flatness over clear aperture
- Antireflective coatings on input and output faces, custom substrate material and dimensions upon request

Application examples

- Beam steering
- Optical system alignment

Optogama unmounted penta prisms provide 90° beam and image deviation without inverting or reversing the image. Penta prisms reflecting surfaces are aluminized with inconel and black paint overcoat, while input and output faces are uncoated (refer to the drawing). An important feature is that these prisms do not have to be precisely aligned to operate properly. Therefore, these five-sided reflecting design prisms are essential for applications, where precise 90° deviation is required. Antireflective coatings have to be applied in order to optimize the optical transmission for a particular application. Contact us for coating service, custom solutions and pricing.



Standard specifications

PENTA PRISMS	
Beam deviation	$90^\circ \pm 1$ arcmin
Wavelength range	Uncoated BK7 prisms: 350 nm - 2 μ m
Clear aperture	>70% of face dimensions length and width
Dimensions tolerance	$\pm 0,1$ mm
Angular tolerance	± 1 arcmin
Protective chamfers	<0,35 mm at 45°
Surface quality	40-20 S-D
Surface flatness	$< \lambda/10 @ 632,8$ nm over clear aperture
Coatings	Reflecting surfaces: aluminized with inconel and black paint overcoat Input and output surfaces: uncoated

Standard products

MATERIAL	FACE DIMENSIONS A X B	SKU	PRICE
BK7	10 x 10 mm	7433	Request
	20 x 20 mm	7434	Request
	40 x 40 mm	7435	Request
	60 x 60 mm	7436	Request

HR right-angle retroreflectors

Main features

- Fabricated from high-quality UV grade fused silica
- Reflectance $R_s > 99.6\%$ per surface
- Coating stack is designed to have low dispersion (GDD) for the reflected wavelengths
- Custom coatings, substrate material and dimensions are available upon request

Application examples

- Ultrashort pulse back reflection
- Delay lines

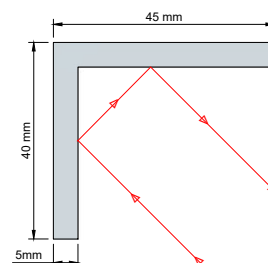
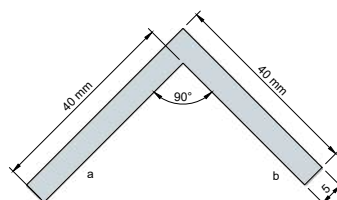
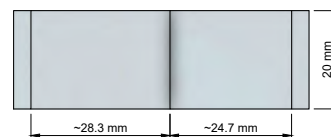
Optogama HR right-angle retroreflectors consist of two highly reflective mirrors glued at right angle with precision as high as < 30 arcsec. Hollow design eliminates the material dispersion, which is inherent in common retroreflector prisms, making them perfect for ultrashort pulse back reflection applications. Right angle retroreflectors are manufactured from high quality UVFS substrates, coated with low GDD high reflective coatings designed for Ti:Sapphire, Erbium and Ytterbium doped host based femtosecond laser systems.

Standard specifications

HR RIGHT-ANGLE RETROREFLECTORS	
Substrate material	UVFS
Aperture dimensions	16 mm
Substrate dimensions	40x20x5 mm
Face dimensions tolerance	+0/-0,1 mm
Thickness tolerance	± 0.2 mm
Surface quality	20-10 S-D
Surface flatness	$< \lambda/6 @ 632.8$ nm
90° angle tolerance	± 30 arcsec
Pyramidal error	< 1 arcmin
Protective chamfers	< 0.25 mm at 45°
AOI	45°

Standard products

MATERIAL	APERTURE DIMENSIONS	REFLECTANCE	AOI	WAVELENGTH RANGE	SKU	PRICE
UVFS	16 mm	$R_s > 99.6\%$, $R_p > 99.2\%$	45°	510-535 nm	28475	290 €
				760-840 nm	28476	340 €
				1020-1070 nm	28474	290 €
				1520-1570 nm	28477	340 €





Optogama provide uncoated flat-parallel windows, flat-wedge windows, and curved windows fabricated from UVFS and BK7 optical glasses for UV, VIS and NIR applications. These optical components are the substrates of mirrors, output couplers and beamsplitters in any kind of laser and optical systems. They are initially uncoated and demand metallic or dielectric coatings for a particular application. Optogama provide coating service upon request. Contact us for custom solutions and pricing.

Windows

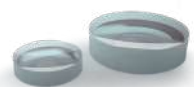
OWS



Flat-parallel windows



Flat-wedge windows



Curved windows

Flat-parallel windows

Main features

- Fabricated from high-quality UV grade fused silica, BK7 glasses
- Optically polished surfaces
- Available in round or rectangular shape with various thicknesses
- Custom coated and uncoated windows are available upon request

Application examples

- Substrates of mirrors and beamsplitters
- Isolation of different physical environments
- Beam sampling

Standard uncoated flat-parallel windows are fabricated from BK7 or UV grade fused silica optical glass. UV grade fused silica glass windows are a good option for UV, ultrashort pulse, and high-power laser applications due to their low sensitivity to temperature variations, relatively high damage threshold and UV transmission down to 185 nm.

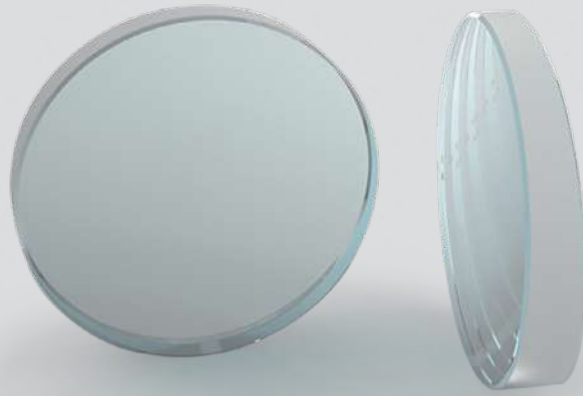
BK7 glass windows are a cost-effective choice for visible and near-infrared range, low/mid-power laser and non-laser applications. These components are initially uncoated and demand metallic or dielectric coatings for a particular application. Optogama provide coating service upon request. Contact us for custom solutions and pricing.

Standard specifications

FLAT-PARALLEL WINDOWS	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 windows: 350 nm - 2 μm Uncoated UVFS windows: 185 nm - 2,1 μm
Clear aperture	>85%
Face dimensions tolerance	+0/-0,15 mm
Thickness tolerance	±0,25 mm
Parallelism error	<30 arcsec
Protective chamfers	≤ø50,8 mm:<0,35 mm at 45° >ø50,8 mm:<0,50 mm at 45°
Surface quality	≤ø25,4 mm: 10-5 S-D >ø25,4 mm: 20-10 S-D
Transmitted wavefront distortion	≤ø25,4 mm:<λ/8@632,8 nm >ø25,4 mm:<λ/5@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	FACE DIMENSIONS	THICKNESS	SURFACE FLATNESS	SKU	PRICE
BK7	ø25,4 mm	6,35 mm	<λ/8@632,8 nm	6247	14 €
	ø38,1 mm	6,35 mm	<λ/5@632,8 nm	6248	24 €
	ø50,8 mm	6,35 mm	<λ/5@632,8 nm	6249	32 €
	ø50,8 mm	9,525 mm	<λ/5@632,8 nm	6250	34 €
	ø76,2 mm	12,7 mm	<λ/4@632,8 nm	6253	100 €
	ø101,6 mm	12,7 mm	<λ/4@632,8 nm	6254	160 €
UVFS	ø12,7 mm	2 mm	<λ/4@632,8 nm	6241	14 €
	ø12,7 mm	6 mm	<λ/8@632,8 nm	6242	14 €
	ø25,4 mm	2 mm	<λ/2@632,8 nm	6222	16 €
	ø25,4 mm	5 mm	<λ/8@632,8 nm	6223	16 €
	ø38,1 mm	6,35 mm	<λ/5@632,8 nm	6244	30 €
	ø50,8 mm	6,35 mm	<λ/5@632,8 nm	6245	68 €
	ø50,8 mm	9,525 mm	<λ/4@632,8 nm	6246	74 €
	ø76,2 mm	12,7 mm	<λ/4@632,8 nm	6251	170 €
	ø101,6 mm	12,7 mm	<λ/4@632,8 nm	6252	280 €
	20 x 40 mm	5 mm	<λ/6@632,8 nm	6243	40 €



Flat-wedge windows

Main features

- Fabricated from high-quality, laser grade polished UV grade fused silica, BK7 glasses
- Standard diameters are $\varnothing 12,7$ mm, $\varnothing 25,4$ and $\varnothing 50,8$ mm
- Wedge angle selection from $0,5^\circ$ to 3°
- Coatings, custom substrate material, dimensions are available upon request

Application examples

- Protection from undesirable laser cavity feedback
- Elimination of fringe pattern due to back reflections
- Variable beam steering
- Beam sampling

Windows with a slight wedge are commonly used to prevent harmful laser cavity feedback and beam interference effects. Standard Optogama uncoated flat-wedge windows are fabricated from BK7 and UV grade fused silica optical glass. UV grade fused silica glass flat-wedge window is a good option for UV, ultrashort pulse and high-power laser applications because of a low sensitivity to temperature variations, relatively high damage threshold and UV transmission down to 185 nm. BK7 glass window is a cost-effective choice for visible and near-infrared range, low or mid-power laser and non-laser applications.

Standard specifications

FLAT-WEDGE WINDOWS	
Substrate material	BK7, UVFS
Wavelength range	Uncoated BK7 windows: 350 nm - 2 μ m Uncoated UVFS windows: 185 nm - 2,1 μ m
Clear aperture	>85%
Diameter tolerance	+0/-0,15 mm
Thickness tolerance	$\pm 0,25$ mm
Wedge tolerance	± 5 arcmin
Protective chamfers	<0,35 mm at 45°
Surface quality	$\varnothing \leq 25,4$ mm: 10-5 S-D $\varnothing > 25,4$ mm: 20-10 S-D
Surface flatness	$\varnothing \leq 25,4$ mm: $\lambda/8 @ 632,8$ nm $\varnothing > 25,4$ mm: $\lambda/5 @ 632,8$ nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	FACE DIMENSIONS	THICKNESS	WEDGE ANGLE	SKU	PRICE
BK7	$\varnothing 12,7$ mm	5 mm	$0,5^\circ$	6277	18 €
	$\varnothing 25,4$ mm	3 mm	1°	6278	30 €
	$\varnothing 25,4$ mm	6,35 mm	3°	6279	30 €
	$\varnothing 50,8$ mm	6,35 mm	1°	6280	54 €
UVFS	$\varnothing 12,7$ mm	5 mm	$0,5^\circ$	6225	20 €
	$\varnothing 25,4$ mm	3 mm	1°	6274	32 €
	$\varnothing 25,4$ mm	6,35 mm	3°	6275	32 €
	$\varnothing 50,8$ mm	6,35 mm	1°	6276	74 €

Curved windows

Main features

- Fabricated from high-quality UVFS glass
- Plano-convex or plano-concave design
- Coatings, custom substrate material, dimensions are available upon request

Application examples

- High reflectivity mirrors, output couplers in laser resonators
- Reflective and refractive optical elements in beam expanders, collimators, reducers, telescopes

Curved windows are an excellent choice as a substrate of reflective and refractive optical elements. Commonly metallic or dielectric thin-film coatings are applied onto the windows surfaces to be used for a particular application. Standard Optogama uncoated curved windows are fabricated from UV grade fused silica glass material. UV grade fused silica glass curved windows are a good option for UV, ultrashort pulse and high-power laser applications because of a low sensitivity to temperature variations, relatively high damage threshold and UV transmission down to 185 nm.

Standard specifications

CURVED WINDOWS	
Substrate material	UVFS
Wavelength range	Uncoated UVFS windows: 185 nm - 2,1 μm
Clear aperture	>85%
Diameter tolerance	+0/-0,1 mm
Thickness tolerance	±0,5 mm
Radius of curvature tolerance	<1%
Centration error	<3 arcmin
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface irregularity	<λ/8@632,8 nm
Coatings	Uncoated, available upon request

Standard products

MATERIAL	FACE DIMENSIONS	TYPE	EDGE THICKNESS	ROC	SKU	PRICE
UVFS	ø25,4 mm	Plano-concave	5 mm	-50 mm	6220	55 €
				-100 mm	6256	55 €
				-200 mm	6259	55 €
				-600 mm	6261	55 €
		-1000 mm	6263	55 €		
		Plano-convex	3,36 mm	+50 mm	6269	55 €
			4,19 mm	+100 mm	6270	55 €
			4,6 mm	+200 mm	6271	55 €
	4,84 mm		+500 mm	6272	55 €	
	ø50,8 mm	Plano-concave	10 mm	+1000 mm	6273	55 €
				-100 mm	32276	205 €
				-200 mm	32277	205 €
				-500 mm	32278	205 €
		Plano-convex	-1000 mm	32279	205 €	
			6,7 mm	+100 mm	32280	215 €
			8,38 mm	+200 mm	32281	215 €
9,35 mm			+500 mm	32282	215 €	
9,68 mm	+1000 mm	32283	215 €			



Optogama provide neutral density absorption filters with flat transmission characteristics over a particular wavelength range. Also, bandpass (interference) filters, which selectively transmit particular wavelength range and eliminate out of band spectral components. Custom filters are available upon request. Contact us for solutions and pricing.

Filter

S



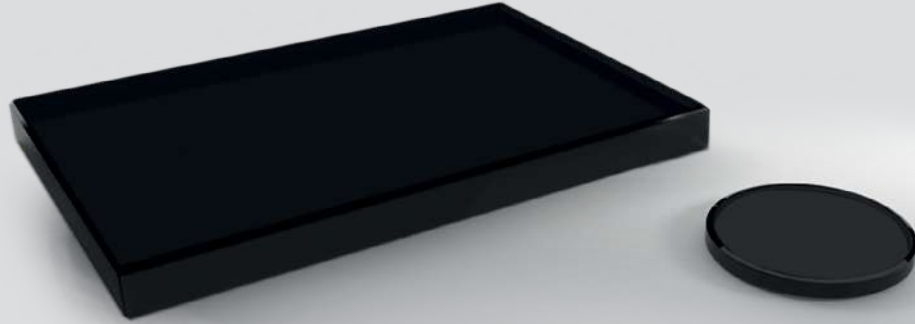
Neutral density
absorption filters



Bandpass
(interference) filters



Circular variable
neutral density filters



Neutral density (by absorption) filters

Main features

- Optical density selection from 0,1 to 4
- $\varnothing 25,4$ mm standard diameter
- Excellent for low-power applications
- Custom dimensions, optical densities are available upon request

Application examples

- Overexposure prevention for cameras and other detectors
- Laser power attenuation

Neutral density (by absorption) filters are designed for a flat transmission over a particular wavelength range and defined by the optical density (OD). Overall optical attenuation is a sum of optical absorption in neutral density optical glass and Fresnel reflection losses. Neutral density optical filter densities add up when used in series.

Standard specifications

NEUTRAL DENSITY (BY ABSORPTION) FILTERS	
Material	Neutral density optical glass
Design wavelength	450-650 nm
Optical density tolerance	$\pm 5\%$
Clear aperture	$> 85\%$
Face dimensions tolerance	$+0/-0,2$ mm
Parallelism error	< 3 arcmin
Protective chamfers	$< 0,35$ mm at 45°
Surface quality	60-40 S-D
Surface flatness	$< 1\lambda @ 632,8$ nm
Coatings	Uncoated, available upon request

Standard products

FACE DIMENSIONS	DESIGN WAVELENGTH	OPTICAL DENSITY	TRANSMISSION	SKU	PRICE
$\varnothing 25,4$ mm	450-650 nm	0,1	79%	6498	25 €
		0,2	63%	6499	25 €
		0,3	50%	6500	25 €
		0,4	40%	6501	25 €
		0,5	32%	6502	25 €
		1	10%	6503	25 €
		1,5	3%	6504	25 €
		2	1%	6505	26 €
		3	0,1%	6506	28 €
		4	0,01%	6507	29 €



Bandpass (interference) filters

Main features

- Out of band transmission <0,01%
- Central wavelength selection from 355 nm to 1064 nm
- Standard mount size is $\varnothing 25,4 \times 6,3$ mm

Application examples

- Fluorescence microscopy
- Spectroscopy
- Imaging

Optogama bandpass (interference) filters selectively transmit specific spectral components, while eliminating the ones out of band. They are designed to be used with collimated light and at normal angle of incidence. Each of these filters is mounted in a black anodized aluminum mount with a propagation direction mark on it. Customization of central wavelength, peak transmission and bandwidth is available upon request.

Standard specifications

BANDPASS (INTERFERENCE) FILTERS	
Center wavelength tolerance	± 2 nm
Out of band transmission	<0,01%
Bandwidth tolerance	± 2 nm
Clear aperture	>80%
Surface quality	80-50 S-D
Mount	$\varnothing 25,4 \times 6,3$ mm black anodized aluminum mount

Standard products

CENTER WAVELENGTH	PEAK TRANSMISSION	BANDWIDTH (FWHM)	BLOCKING RANGE	TYPICAL APPLICATION	SKU	PRICE
355 nm	$\geq 25\%$	10 nm	200-3000 nm	Nd:YAG laser line	6465	Request
460 nm	$\geq 65\%$	10 nm	200-1150 nm	Argon laser line	6466	Request
488 nm	$\geq 65\%$	10 nm	200-1150 nm	Argon laser line	6467	Request
514,5 nm	$\geq 65\%$	10 nm	200-1150 nm	Argon laser line	6468	Request
532 nm	$\geq 70\%$	10 nm	200-1150 nm	Nd:YAG laser line	6469	Request
543,5 nm	$\geq 70\%$	10 nm	200-1150 nm	HeNe laser line	6470	Request
600 nm	$\geq 50\%$	10 nm	200-1200 nm	General	6471	Request
635 nm	$\geq 70\%$	10 nm	200-1150 nm	Diode	6472	Request
647,1 nm	$\geq 70\%$	10 nm	200-1150 nm	Krypton laser line	6473	Request
694 nm	$\geq 70\%$	10 nm	200-1150 nm	Ruby laser line	6474	Request
730 nm	$\geq 70\%$	10 nm	200-1150 nm	Diode	6475	Request
780 nm	$\geq 70\%$	10 nm	200-1150 nm	Diode	6476	Request
800 nm	$\geq 50\%$	10 nm	200-1200 nm	General	6477	Request
810 nm	$\geq 50\%$	10 nm	200-1200 nm	General	6478	Request
850 nm	$\geq 70\%$	10 nm	200-1150 nm	Diode	6479	Request
905 nm	$\geq 70\%$	10 nm	200-1150 nm	Diode	6480	Request
940 nm	$\geq 50\%$	10 nm	200-1200 nm	General	6481	Request
980 nm	$\geq 50\%$	10 nm	200-1200 nm	General	6482	Request
1064 nm	$\geq 70\%$	10 nm	200-1150 nm	Nd:YAG laser line	6483	Request

Circular variable neutral density filters

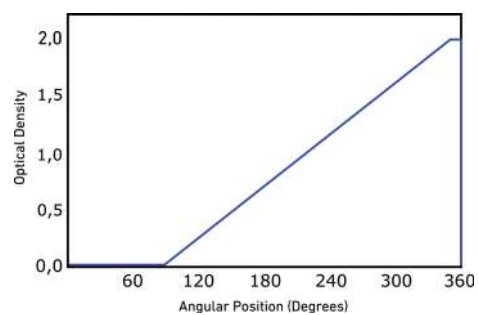
Main features

- Wide operational wavelength range (250-2500 nm with UVFS substrate)
- Maintains the transmitted spectral profile

Application examples

- Continuously variable light attenuation over a broad wavelength range

Circular ND filters provide continuously variable, linear attenuation of light intensity by rotating the filter around its center. Transmitted intensity varies as a function of the optical density range. The filter can be used for natural light and also for laser applications. By using two filters in combination in reverse rotation can obtain a fixed density attenuation and extends the number applications. Sizes are available from 25 mm to 100 mm in diameter.



Standard specifications

CIRCULAR VARIABLE NEUTRAL DENSITY FILTERS	
Substrate material	BK7 or UVFS
Operating wavelength range	380-2000 nm (BK7) 250-2500 nm (UVFS)
Type	Reflective metal coated (gradient thickness metal layer)
Calibration wavelength	532 nm
Inner hole diameter	8.0 mm
Inner hole diameter tolerance	+0,15/-0,00 mm
Outside diameter tolerance	+0,00/-0,15 mm
Thickness	1,75 mm
Surface flatness	$\lambda @ 632,8 \text{ nm}$
Surface quality	60-40 S-D
Clear aperture	>90%
Coated area	0-270 deg
Parallelism	<math>< 3 \text{ arcmin}</math>

Standard products

SUBSTRATE MATERIAL	OPERATING RANGE	OUTER DIAMETER	OPTICAL DENSITY RANGE	AVERAGE TRANSMISSION IN VIS	SKU	PRICE		
BK7	380-2000 nm	ø25 mm	0,04-1	90% to 10%	15676	165 €		
			0,04-2	90% to 1%	15677	165 €		
			0,04-3	90% to 0,1%	15678	165 €		
		ø50 mm	0,04-1	90% to 10%	15679	210 €		
			0,04-2	90% to 1%	15680	210 €		
			0,04-3	90% to 0,1%	15681	210 €		
			ø100 mm	0,04-1	90% to 10%	15682	285 €	
				0,04-2	90% to 1%	15683	285 €	
				0,04-3	90% to 0,1%	15684	285 €	
		UVFS	250-2500 nm	ø25 mm	0,04-1	90% to 10%	15685	205 €
					0,04-2	90% to 1%	15686	205 €
					0,04-3	90% to 0,1%	15687	205 €
ø50 mm	0,04-1			90% to 10%	15688	250 €		
	0,04-2			90% to 1%	15689	250 €		
	0,04-3			90% to 0,1%	15690	250 €		
	ø100 mm			0,04-1	90% to 10%	15691	325 €	
				0,04-2	90% to 1%	15692	325 €	
				0,04-3	90% to 0,1%	15693	325 €	

Polarization optics

Optogama provide optical elements for polarization manipulation and controlling. Standard components include quarter-wave and half-wave three types of waveplates: zero-order compensated, air-spaced crystalline quartz waveplates, crystalline quartz and magnesium fluoride achromatic waveplates for

broadband applications and zero-order, monolithic design Mid-IR (MWIR, LWIR) waveplates. Standard polarization optics also include birefringent and thin-film polarizers: Glan-type polarizers, polarizing cubes, Brewster-type thin-film and high-contrast thin-film polarizers for UV, VIS and NIR applications.



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S



Crystalline quartz waveplates



Achromatic (broadband) waveplates



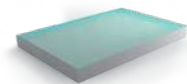
Mid-infrared (IR) waveplates



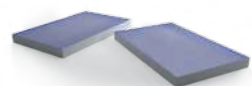
Glan-type polarizers



Polarizing cubes



Brewster-type thin-film polarizers



High contrast thin-film polarizers

Crystalline quartz waveplates



Main features

- Zero-order compensated, air-spaced design
- True first order (FO), optically bonded on UVFS plate waveplates for high power UV application
- Wide quarter and half waveplate selection
- Mounted in $\varnothing 25,4 \times 6$ mm black anodized metal mount
- $\varnothing 18$ mm clear aperture
- Antireflective coatings ($R < 0,15\%$) on each surface
- Custom size, operating wavelength and retardation available upon request

Application examples

- Linear-to-circular polarization transformation and vice versa
- Linear polarization rotation
- Optical isolation

Optogama provide mounted crystalline quartz zero-order compensated, air-spaced half-wave and quarter-wave retardance waveplates designed for a particular wavelength in the range of 257 - 1550 nm. Air-spaced construction enables these waveplates to be used for high-power applications, while zero-order design features lower temperature and wavelength dependence compared to low and multiple order waveplates.

Standard specifications

CRYSTALLINE QUARTZ WAVEPLATES	
Material	High-purity crystalline quartz
Type	Zero order (ZO) compensated, air-spaced and first order (FO), optically bonded for UV application
Available operating wavelength range	200 nm - 2200 nm
Typical retardation tolerance	$< \lambda / 300 @ 20^\circ \text{C}$
Clear aperture	$\varnothing 18$ mm
Parallelism error	< 5 arcsec
Surface quality	20-10 S-D
Transmitted wavefront distortion	$< \lambda / 10 @ 632,8$ nm
Coatings	Antireflective coatings ($R < 0,15\%$) on each surface
LIDT	$> 12 \text{ J/cm}^2 @ 1064$ nm, 10 ns (for 1064 nm waveplates)
Mount	Mounted in $\varnothing 25,4 \times 6$ mm black anodized metal mount

Standard products

CLEAR APERTURE	RETARDATION	ORDER	TYPE	WAVELENGTH	SKU	PRICE
$\varnothing 18$ mm	$\lambda/2$	First order	Optically bonded	257 nm	10759	215 €
				266 nm	10750	215 €
				343 nm	10747	195 €
				355 nm	10748	195 €
				400 nm	8078	195 €
		515 nm	8079	195 €		
		532 nm	8080	195 €		
		780 nm	8081	195 €		
		800 nm	8082	195 €		
		1030 nm	8083	195 €		
	1064 nm	8084	195 €			
	1550 nm	8085	195 €			
	$\lambda/4$	First order	Optically bonded	257 nm	15664	215 €
				266 nm	15665	215 €
				343 nm	13325	195 €
				355 nm	13611	195 €
				400 nm	8066	195 €
		515 nm	8067	195 €		
		532 nm	8068	195 €		
		780 nm	8069	195 €		
800 nm		8070	195 €			
1030 nm		8071	195 €			
1064 nm	8072	195 €				
1550 nm	8073	195 €				



Achromatic (broadband) waveplates

Main features

- Air-spaced design
- Mounted in $\varnothing 25,4 \times 6$ mm black anodized metal mount
- $\varnothing 12$ mm and $\varnothing 18$ mm clear aperture selection
- Broadband antireflective coatings ($R < 0,5\%$) on each surface
- Custom size, operating wavelength range and retardation available upon request

Application examples

- Linear-to-circular polarization transformation and vice versa
- Linear polarization rotation
- Optical isolation

Lasers provide mounted achromatic (broadband) half-wave and quarter-wave retardance waveplates for several bands in the wavelength range of 460 nm - 1700 nm. Air-spaced construction allows to use these waveplates for high-power applications. These waveplates are ideal for multiple wavelengths and broadband operation, due to their constant retardance over a particular broad wavelength range.

Standard specifications

ACHROMATIC (BROADBAND) WAVEPLATES	
Material	High-purity crystalline quartz and magnesium fluoride
Type	Air-spaced
Retardation tolerance	$< \lambda/100 @ 20^\circ \text{C}$
Parallelism error	< 5 arcsec
Surface quality	40-20 S-D
Transmitted wavefront distortion	$< \lambda/8 @ 632,8$ nm
Coatings	BBAR($R < 0,5\%$) on each surface
Laser induced damage threshold	$> 8 \text{ J/cm}^2 @ 1064$ nm, 10 ns (for 650-1100 nm waveplates)
Mount	Mounted in $\varnothing 25,4 \times 6$ mm black anodized metal mount

Standard products

RETARDATION	WAVELENGTH	CLEAR APERTURE	SKU	PRICE
$\lambda/2$	460-650 nm	$\varnothing 12$ mm	8107	395 €
		$\varnothing 18$ mm	8109	595 €
	650-1100 nm	$\varnothing 12$ mm	8111	395 €
		$\varnothing 18$ mm	8113	595 €
	1000-1700 nm	$\varnothing 12$ mm	8115	395 €
		$\varnothing 18$ mm	8117	595 €
$\lambda/4$	460-650 nm	$\varnothing 12$ mm	8106	395 €
		$\varnothing 18$ mm	8108	595 €
	650-1100 nm	$\varnothing 12$ mm	8110	395 €
		$\varnothing 18$ mm	8112	595 €
	1000-1700 nm	$\varnothing 12$ mm	8114	395 €
		$\varnothing 18$ mm	8116	595 €

Mid-infrared (MIR) waveplates



Main features

- Zero-order, monolithic design
- Operating wavelength selection from 2800 nm to 10600 nm
- Mounted in ø25,4 x 6 mm black anodized metal mount
- ø6 mm and ø10 mm standard clear apertures
- Custom size, operating wavelength available upon request

Application examples

- Linear-to-circular polarization transformation and vice versa
- Linear polarization rotation
- Optical isolation

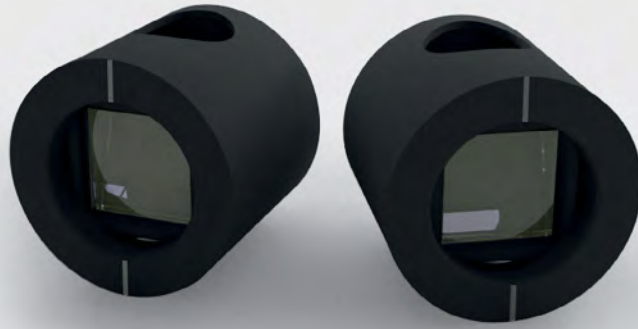
Optogama provide unique zero-order, monolithic design mid-infrared (MWIR and LWIR) waveplates mounted in ø25,4 x 6 mm black anodized metal mount for the range of 2800 nm - 10600 nm. These waveplates are available with quarter-wave, half-wave or any other custom retardance. MWIR and LWIR waveplates designed for a particular wavelength in the range from 3500 nm to 10600 nm are antireflective coated, while 2800 nm - 3000 nm waveplates are uncoated.

Standard specifications

MID-IR WAVEPLATES	
Type	Zero-order, monolithic
Available operating wavelength range	2800 nm - 10600 nm
Retardation tolerance	~λ/50@20 °C
Clear aperture	ø6 mm and ø10 mm
Parallelism error	<1 arcmin
Surface quality	60-40 S-D
Coatings	Antireflective coating (R<1%) on each surface or uncoated
Laser induced damage threshold	2 J/cm ² @ 9000 nm, 10 ns (for 9000nm waveplates)
Mount	Mounted in ø25,4 x 6 mm black anodized metal mount

Standard products

CLEAR APERTURE	RETARDATION	COATINGS	WAVELENGTH	SKU	PRICE
ø10 mm	λ/2	Uncoated	3000 nm	13219	455 €
			3500 nm	8175	455 €
			4000 nm	8177	455 €
			4500 nm	8179	455 €
			5000 nm	8181	455 €
			5500 nm	8183	455 €
		AR coated	6000 nm	8185	455 €
			6500 nm	8187	455 €
			7000 nm	8189	455 €
			7500 nm	8191	1680 €
			8000 nm	8193	1680 €
			8500 nm	8195	1680 €
			9000 nm	8197	1680 €
			9500 nm	8199	1680 €
10000 nm	19791	1680 €			
10600 nm	19793	1680 €			
ø10 mm	λ/4	Uncoated	3000 nm	13220	455 €
			3500 nm	8174	455 €
			4000 nm	8176	455 €
			4500 nm	8178	455 €
			5000 nm	8180	455 €
			5500 nm	8182	455 €
		AR coated	6000 nm	8184	455 €
			6500 nm	8186	455 €
			7000 nm	8188	455 €
			7500 nm	8190	1680 €
			8000 nm	8192	1680 €
			8500 nm	8194	1680 €
			9000 nm	8196	1680 €
			9500 nm	8198	1680 €
10000 nm	19790	1680 €			
10600 nm	19792	1680 €			
ø6 mm	λ/2	Uncoated	7500 nm	19893	840 €
			8000 nm	19894	840 €
			8500 nm	19895	840 €
			9000 nm	19896	840 €
			9500 nm	19897	840 €
			10000 nm	19898	840 €
		AR coated	10600 nm	19899	840 €
			7500 nm	19901	840 €
			8000 nm	19903	840 €
			8500 nm	19904	840 €
			9000 nm	19905	840 €
			9500 nm	19908	840 €
			10000 nm	19909	840 €
			10600 nm	19910	840 €
ø6 mm	λ/4	Uncoated	7500 nm	19893	840 €
			8000 nm	19894	840 €
			8500 nm	19895	840 €
			9000 nm	19896	840 €
			9500 nm	19897	840 €
			10000 nm	19898	840 €
		AR coated	10600 nm	19899	840 €
			7500 nm	19901	840 €
			8000 nm	19903	840 €
			8500 nm	19904	840 €
			9000 nm	19905	840 €
			9500 nm	19908	840 €
			10000 nm	19909	840 €
			10600 nm	19910	840 €



Glan-type polarizers

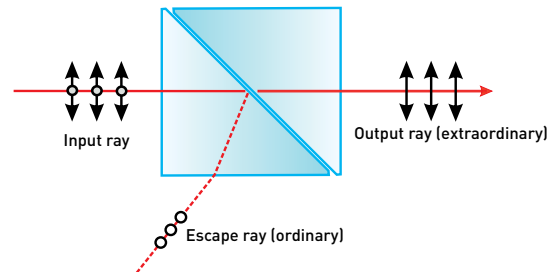
Main features

- Substrate material: α -BBO, calcite and YVO_4
- Extremely high extinction ratio over a wide wavelength range
- Air-spaced configuration
- Minor transmitted beam displacement and deviation
- Single MgF_2 coating layer on every optical face for optimized broadband transmission
- Customization available upon request

Application examples

- Optical isolation
- Polarization separation
- Polarization cleaning
- Laser power attenuation

Optogama provide air-spaced Glan-Taylor and Glan-laser type polarizers fabricated from α -BBO (UV), calcite (VIS to NIR), YVO_4 (VIS to Mid-IR) birefringent crystalline material and mounted in a barrel-type black anodized aluminum mount. Glan-type polarizers are constructed to transmit only the extra-ordinary polarized beam, while ordinary polarized beam is deflected. These polarizers feature an extremely high extinction ratio over a wide wavelength range and their common applications include polarization separation, polarization cleaning, power attenuation. Glan-Taylor polarizers are designed for low and mid-power applications, while Glan-Laser – for high-power regime due to their higher damage threshold and escape window in housing for deflected ordinary polarized beam. Single MgF_2 layer is applied onto Glan-type polarizer optical surfaces in order to noticeably maximize their broadband transmission.



Standard specifications

GLAN-TYPE POLARIZERS	
Extinction ratio (transmitted beam)	α -BBO and YVO_4 polarizers: $<5 \times 10^{-4}$ Calcite polarizers: $<5 \times 10^{-5}$
Beam deviation	<3 arcmin
Length tolerance	$\pm 0,1$ mm
Parallelism error	<1 arcmin
Surface quality	20-10 S-D
Surface flatness	$<\lambda/4$ @ 632.8 nm
Coatings	Single MgF_2 layer
LIDT	Glan-Taylor polarizers: >200 MW/cm ² @ 1064 nm, 10 ns Glan-laser polarizers: >500 MW/cm ² @ 1064 nm, 10 ns
Mount	Black anodized aluminum barrel-type mount

Standard products

MATERIAL	WAVELENGTH RANGE	TYPE	MOUNT DIAMETER	CLEAR APERTURE	MOUNT LENGTH	SKU	PRICE
Calcite	350-2300 nm	Glan-Laser	$\varnothing 15$ mm	6 mm	21 mm	7425	410 €
			$\varnothing 25,4$ mm	8 mm	25 mm	7426	485 €
			$\varnothing 25,4$ mm	10 mm	26 mm	7427	560 €
		Glan-Taylor	$\varnothing 15$ mm	6 mm	21 mm	7413	400 €
			$\varnothing 25,4$ mm	8 mm	25 mm	7414	475 €
			$\varnothing 25,4$ mm	10 mm	26 mm	7415	550 €
YVO_4	500-4000 nm	Glan-Laser	$\varnothing 15$ mm	6 mm	16 mm	7428	550 €
			$\varnothing 25,4$ mm	8 mm	19 mm	7429	620 €
			$\varnothing 25,4$ mm	10 mm	22 mm	7430	760 €
		Glan-Taylor	$\varnothing 15$ mm	6 mm	16 mm	7416	540 €
			$\varnothing 25,4$ mm	8 mm	19 mm	7417	610 €
			$\varnothing 25,4$ mm	10 mm	22 mm	7418	750 €
α -BBO	200-300 nm	Glan-Laser	$\varnothing 15$ mm	6 mm	29 mm	7419	560 €
			$\varnothing 25,4$ mm	8 mm	31 mm	7420	610 €
			$\varnothing 25,4$ mm	10 mm	31 mm	7421	710 €
		Glan-Taylor	$\varnothing 15$ mm	6 mm	25 mm	7422	550 €
			$\varnothing 25,4$ mm	8 mm	25 mm	7423	600 €
			$\varnothing 25,4$ mm	10 mm	26 mm	7424	700 €
α -BBO	300-700 nm	Glan-Laser	$\varnothing 15$ mm	6 mm	29 mm	7407	500 €
			$\varnothing 25,4$ mm	8 mm	31 mm	7408	560 €
			$\varnothing 25,4$ mm	10 mm	31 mm	7409	650 €
		Glan-Taylor	$\varnothing 15$ mm	6 mm	25 mm	7410	500 €
			$\varnothing 25,4$ mm	8 mm	25 mm	7411	560 €
			$\varnothing 25,4$ mm	10 mm	26 mm	7412	650 €

Polarizing cubes



Main features

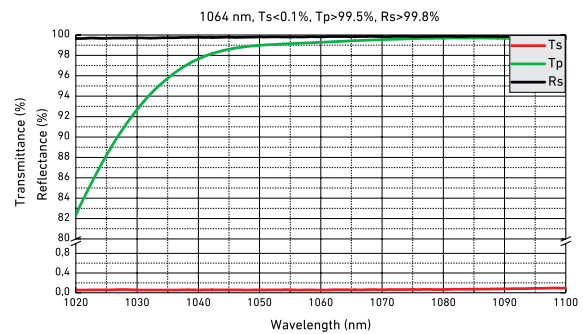
- Optically contacted or epoxy glued configurations available
- Minor transmitted beam deviation (<3 arcmin)
- Antireflective coated input and output faces

Application examples

- Beam separation and combining by polarization
- Polarization separation

Standard specifications

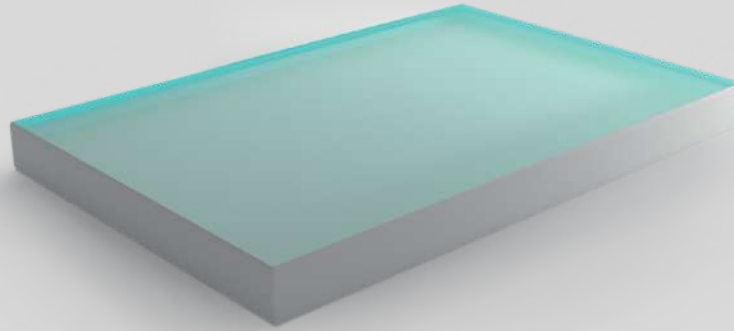
POLARIZING CUBES	
Beam deviation	<3 arcmin
Clear aperture	>85%
Face dimensions tolerance	+0/-0.2 mm
Thickness tolerance	±0.25 mm
Protective chamfers	<0.35 mm at 45°
Coatings	Hypotenuse face: polarization beamsplitting coating Input and output faces: antireflective coatings
Surface quality	40-20 S-D
Surface flatness	<λ/4@632.8 nm
Laser induced damage threshold	>15 J/cm²@1064 nm, 10 ns (for 1025-1080 nm optically contacted cubes) >0.1 J/cm²@532 nm, 10 ns (for 400-700 nm epoxy glued cubes)
Mount	Unmounted, available upon request



Optogama unmounted polarizing cubes are fabricated from two identical right-angle prisms with their hypotenuse faces adhered together via optical contact or epoxy glue. Polarizing cubes are designed to transmit p-polarized light with minor deviation (<3 arcmin) and deflect s-polarized light by 90° angle. Prior to cementing polarizing dielectric thin-film coating is applied onto the hypotenuse face of one of the prisms, while input and exit surfaces are antireflective coated for particular wavelength range. Optogama optically contacted polarizing cubes provide higher laser induced damage threshold, therefore are primarily used for high-power applications, while epoxy glued cubes are a cost-effective choice for low and mid-power applications. We recommend to use these elements with collimated laser beams in order to avoid beam aberrations.

Standard products

TYPE	APPLICATION	TRANSMISSION (P-POL)	TRANSMISSION (S-POL)	WAVELENGTH RANGE	DIMENSIONS	SKU	PRICE
Epoxy glued	Low and mid-power	>92%	<0.2%	400-700 nm	6,35 x 6,35 x 6,35 mm	7442	130 €
					12,7 x 12,7 x 12,7 mm	7443	150 €
					25,4 x 25,4 x 25,4 mm	7444	175 €
	High-power	>96%	<0.1%	345-360 nm	6,35 x 6,35 x 6,35 mm	7439	180 €
					12,7 x 12,7 x 12,7 mm	7440	310 €
					25,4 x 25,4 x 25,4 mm	7441	500 €
Optically contacted	Low and mid-power	>96%	<0.1%	510-535 nm	6,35 x 6,35 x 6,35 mm	7445	180 €
					12,7 x 12,7 x 12,7 mm	7446	310 €
					25,4 x 25,4 x 25,4 mm	7447	500 €
	High-power	>92%	<0.15%	650-900 nm	6,35 x 6,35 x 6,35 mm	7448	190 €
					12,7 x 12,7 x 12,7 mm	7449	340 €
					25,4 x 25,4 x 25,4 mm	7450	530 €
High-power	>96%	<0.1%	1025-1080 nm	6,35 x 6,35 x 6,35 mm	7451	180 €	
				12,7 x 12,7 x 12,7 mm	7452	310 €	
				25,4 x 25,4 x 25,4 mm	7453	500 €	
High-power	>96%	<0.1%	1520-1570 nm	6,35 x 6,35 x 6,35 mm	7454	180 €	
				12,7 x 12,7 x 12,7 mm	7455	325 €	
					25,4 x 25,4 x 25,4 mm	7456	515 €



Brewster-type thin-film polarizers

Main features

- Substrates fabricated from high-quality UV grade fused silica optical glass
- Designed for most popular laser line and harmonic wavelengths
- Angle of incidence: Brewster-angle
- Typical extinction ratio $T_p:T_s > 200:1$
- Custom dimensions, operating wavelength available upon request

Application examples

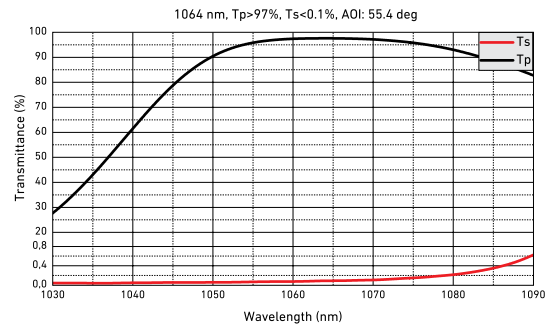
- Polarization separation
- Optical isolation
- Polarization cleaning
- Laser power attenuation

Standard specifications

BREWSTER-TYPE THIN-FILM POLARIZERS	
Material	UVFS
Clear aperture	>85%
Face dimensions tolerance	+0,0/-0,15 mm
Thickness tolerance	± 0,25 mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	< $\lambda/8$ @632,8 nm for 10x20 mm; < $\lambda/6$ @632,8 nm for 20 x 40 mm
Transmitted wavefront distortion	< $\lambda/10$ @632,8 nm for 10x20 mm; < $\lambda/6$ @632,8 nm for 20 x 40 mm
Laser induced damage threshold	>10 J/cm ² @1064 nm, 10 ns (for 1064 nm polarizers)
Mount	Unmounted, available upon request

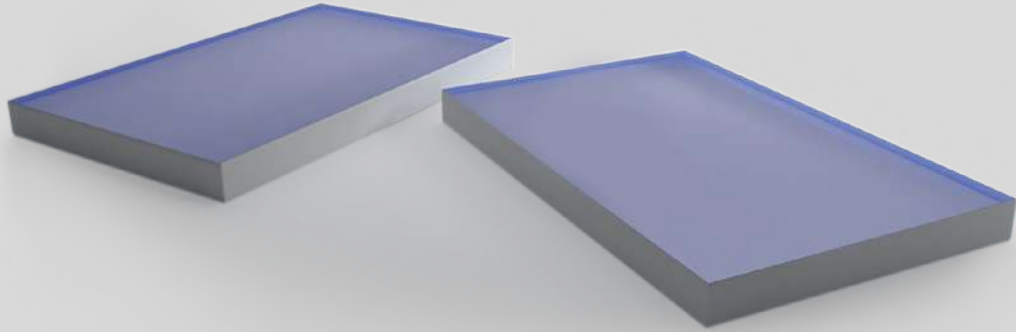
Standard products

FACE DIMENSIONS	THICKNESS	TRANSMISSION (P-POL)	TRANSMISSION (S-POL)	AOI	WAVELENGTH	SKU	PRICE
10 x 20 mm	5 mm	>95%	<1%	55,4°	266 nm	9375	110 €
			<0,5%	55,4°	343 nm	9376	80 €
			<0,5%	55,4°	355 nm	9377	80 €
			<0,5%	55,4°	515 nm	9378	80 €
			<0,5%	55,4°	532 nm	9379	80 €
			<0,5%	55,4°	1030 nm	9380	80 €
			<0,5%	55,4°	1064 nm	9381	80 €
			<1%	55,4°	266 nm	9368	275 €
			<0,5%	55,4°	343 nm	9369	135 €
			<0,5%	55,4°	355 nm	9370	135 €
20 x 40 mm	5 mm	>95%	<0,5%	55,4°	515 nm	9371	135 €
			<0,5%	55,4°	532 nm	9372	135 €
			<0,5%	55,4°	1030 nm	9373	135 €
			<0,5%	55,4°	1064 nm	9374	135 €



Optogama standard Brewster-type thin-film polarizers are designed for applications, which require polarization separation. These elements provide a moderate extinction ratio $T_p:T_s > 200:1$ and are perfectly fit for high-power and UV applications. Optogama design and manufacture standard and custom Brewster type polarizers in the range of 230 nm and 2000 nm with face dimensions up to 160 mm.

High-contrast thin-film polarizers



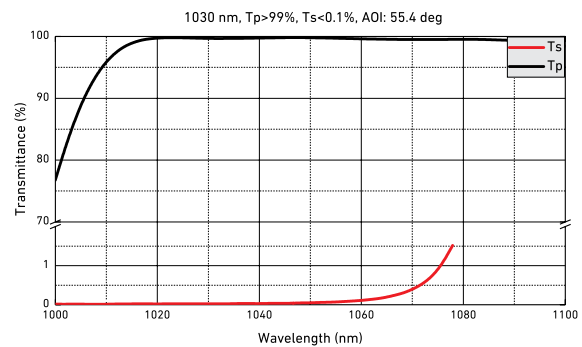
Main features

- Substrates fabricated from high-quality UV grade fused silica optical glass
- Designed for most popular laser line and harmonic wavelengths
- Brewster and 45° angle of incidence selection
- Typical extinction ratio Tp:Ts > 1000:1
- Custom dimensions, operating wavelength available upon request

Application examples

- Polarization separation
- Optical isolation
- Polarization cleaning
- Laser power attenuation

Optogama standard high contrast Brewster-type and 45° thin-film polarizers provide high extinction ratio Tp:Ts > 1000:1 thanks to the ion beam sputtered (IBS) thin-film coatings. Moreover, these polarizers are ideal for high-power levels and UV wavelength range. Optogama design and manufacture standard and custom Brewster type high contrast polarizers for the wavelength range between 230 nm and 2000 nm with face dimensions up to 160 mm.



Standard specifications

HIGH CONTRAST THIN-FILM POLARIZERS	
Material	UVFS
Clear aperture	>85%
Face dimensions tolerance	+0/0,15 mm
Thickness tolerance	± 0,25 mm
Parallelism error	<30 arcsec
Protective chamfers	<0,35 mm at 45°
Surface quality	20-10 S-D
Surface flatness	<λ/2@632,8 nm for 10x20 mm; <λ/2@632,8 nm for 20x40 mm
Transmitted wavefront distortion	<λ/10@632,8 nm for 10x20 mm; <λ/6@632,8 nm for 20 x 40 mm
Laser induced damage threshold	>12 J/cm²@1064 nm, 10 ns (for 1064 nm polarizer)
Mount	Unmounted

Standard products

EXTINCTION RATIO (TP/TS)	AOI	THICKNESS	FACE DIMENSIONS	WAVELENGTH	SKU	PRICE	
>1000:1	55,4°	5 mm	10 x 20 mm	343 nm	9185	105 €	
				355 nm	9186	105 €	
				525 nm	9187	105 €	
				532 nm	9188	105 €	
				1030 nm	9189	105 €	
				1064 nm	9190	105 €	
			20 x 40 mm	343 nm	9179	205 €	
				355 nm	9180	205 €	
				515 nm	9181	205 €	
				532 nm	9182	205 €	
				1030 nm	9183	205 €	
				1064 nm	9184	205 €	
>500:1	45°	5 mm	10 x 20 mm	515 nm	28435	120 €	
				532 nm	28432	120 €	
				1030 nm	28429	120 €	
				1064 nm	28426	120 €	
				20 x 40 mm	515 nm	28434	275 €
					532 nm	28431	275 €
			1030 nm		28428	275 €	
			1064 nm		28425	275 €	
			25,4 mm		515 nm	28436	175 €
					532 nm	28433	175 €
				1030 nm	28430	175 €	
				1064 nm	28427	175 €	

Beam delivery device

Optogama designs and manufactures compact laser beam delivery systems, laser beam expanders, reducers, divergence compensators and laser power attenuators, which are used to increase or decrease laser beam diameter, control beam divergence, and adjust laser power.



n ery ces



Compact motorized laser beam expanders MEX



High-power motorized beam expanders MEX-HP



Vertical motorized laser beam expander MEX-V



Variable beam expanders VEX and reducers VRE



Fixed ratio laser beam expanders FEX



Motorized laser power attenuators LPA



Manual laser power attenuators LPA-M



Unpolarized beam motorized laser power attenuator LPA-U



Flat top converter FTC



Motorized polarization rotator MRO



Compact motorized laser beam expanders MEX

Main features

- Highest beam pointing stability (< 0,3 mrad)
- All-in-one design with integrated controller
- Two lens simultaneous SMART movement assuring no misfocus
- Absolute encoder (both lenses)
- Adjustment time <1 sec (all magnifications)
- Fused silica optical elements
- No homing after switching on/off
- Diffraction limited performance for all magnifications

Application examples

- Industrial laser micromachining
- Life sciences
- Research

Motorized laser beam expanders MEX series are used to increase the laser beam diameter and adjust divergence. Standard or custom-made beam expanders feature a unique mechanical closed loop sliding-lens design ensuring high pointing stability and minimal dimensions. These variable magnification (zoom) beam expanders and reducers are designed for required wavelength and each type of our beam expanders have motorized divergence adjustability.

Standard specifications

MOTORIZED BEAM EXPANDERS SPECIFICATIONS	
Adjustment	Motorized
Divergence	Adjustable
Clear input aperture	11,5 mm
Transmission	>97%
Optical element number	3 (MEX13, MEX18), 4 (MEX18-ACH)
Lens material	UVFS
Control interface	USB or RS232
Housing material	Black anodized aluminum
LIDT	3 J/cm ² (10 ns @ 355 nm) 5 J/cm ² (10 ns @ 532 nm) 10 J/cm ² (10 ns @ 1064 nm)

*Custom design available

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	CLEAR OUTPUT APERTURE	RECOMMENDED MAX INPUT BEAM DIAMETER (1/E2)	DIMENSIONS (H X W X L)	DESIGN WAVELENGTH	POINTING STABILITY	SKU	PRICE							
MEX13	1.0x - 3.0x continuous	11.5 mm	23 mm	ø7 mm (1x) - ø6 mm (3x)	45 x 45 x 140 mm	1030-1064 nm	<0,5 mrad	6825	2400 €							
						515-532 nm		6833	2400 €							
						343-355 nm		6838	2600 €							
						1030-1064 + 515-532 nm		6836	2600 €							
						515-532 + 343-355 nm		6131	2700 €							
						760-840 nm		31223	2400 €							
						390-410 nm		31224	2400 €							
						400 + 800 nm		31225	2600 €							
						1030-1064 nm		6855	2600 €							
						515-532 nm		6856	2600 €							
						343-355 nm		6857	2800 €							
						1030-1064 + 515-532 nm		<0,2 mrad	6927	2800 €						
						515-532 + 343-355 nm		6928	2900 €							
						760-840 nm		31226	2600 €							
						390-410 nm		31227	2600 €							
						400 + 800 nm		31228	2800 €							
						MEX18		1.0x - 8.0x continuous	11.5 mm	38 mm	ø7 mm (1x) - ø5mm (5x) mm - ø3 mm (8x)	45 x 45 x 237 mm	1030-1064 nm	<0,5 mrad	6841	2800 €
													515-532 nm		6842	2800 €
343-355 nm	6121	3000 €														
1030-1064 + 515-532 nm	6843	3000 €														
515-532 + 343-355 nm	6844	3100 €														
760-840 nm	31229	2800 €														
390-410 nm	31230	2800 €														
400 + 800 nm	31231	3000 €														
1030-1064 nm	31232	3000 €														
515-532 nm	31233	3000 €														
343-355 nm	31234	3200 €														
1030-1064 + 515-532 nm	<0,2 mrad	31235	3200 €													
515-532 + 343-355 nm	31236	3300 €														
760-840 nm	31237	3000 €														
390-410 nm	31238	3000 €														
400 + 800 nm	31239	3200 €														
MEX18-ACH	1.0x - 8.0x continuous	11.5 mm	38 mm	ø7 mm (1x) - ø5mm (5x) mm - ø3 mm (8x)	45 x 45 x 237 mm		300-750 nm						<0,5 mrad		9235	3400 €

Mounting options for motorized beam expanders MEX

MOUNTING OPTION	FOR BEAM HEIGHT OF	SKU	PRICE
Manual 4 axis translation stage M-STAGE	27 mm (±2 mm travel)	12571	580 €



Compact motorized laser beam expanders MEX-V2

Main features

- Highest beam pointing stability ($< 0,1$ mrad)
- All-in-one design with integrated controller
- Two lens simultaneous SMART movement assuring no misfocus
- Absolute encoder (both lenses)
- Adjustment time $< 0,7$ sec (all magnifications)
- Fused silica optical elements
- No homing after switching on/off
- Diffraction limited performance for all magnifications
- Remotely changing focused beam spot size and its position on Z axis

What's new?

- 30% faster and more stable lens movement ($< 0,7$ sec)
- Optimized for 24/7 usage
- Improved pointing stability $< 0,1$ mrad or $< 0,3$ mrad
- Redesigned Controller with Reverse polarity and Overcurrent protection

Application examples

- Industrial laser micromachining 24/7
- Life sciences
- Research

Motorised laser beam expanders MEX-V2 series are used to increase the laser beam diameter and adjust divergence. Standard or custom-made beam expanders feature a unique mechanical closed-loop sliding-lens design ensuring high pointing stability and minimal dimensions. Improved lens movement speed and pointing stability ensure better control quality. These variable magnification (zoom) beam expanders and reducers are designed for the required wavelength and each type of our beam expanders has motorized divergence adjustability.

What's in the box?

- Motorised laser beam expander MEX-V2
- USB key with software and manual
- Power supply DC 12V
- USB (1,5 m) cable

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	CLEAR OUTPUT APERTURE	RECOMMENDED MAX INPUT BEAM DIAMETER (1/E2)	DIMENSIONS (H X W X L)	DESIGN WAVELENGTH	POINTING STABILITY	SKU	PRICE
MEX13-V2	1.0x - 3.0x continuous	11,5 mm	23 mm	ø7 mm (1x) - ø6 mm (3x)	45 x 45 x 140 mm	1030-1064 nm	<0,3 mrad	29283	2600 €
						515-532 nm		29284	2600 €
						343-355 nm		29285	2800 €
						1030-1064 + 515-532 nm		29286	2800 €
						515-532 + 343-355 nm		29287	2900 €
						760-840 nm		31274	2600 €
						390-410 nm		31275	2600 €
						400 + 800 nm		31276	2800 €
						1030-1064 nm		29288	2800 €
						515-532 nm		29289	2800 €
						343-355 nm		29290	3000 €
						1030-1064 + 515-532 nm		29291	3000 €
						515-532 + 343-355 nm		29292	3100 €
						760-840 nm		31277	2800 €
						390-410 nm		31278	2800 €
						400 + 800 nm		31279	3000 €
MEX18-V2	1.0x - 8.0x continuous	11,5 mm	38 mm	ø7 mm (1x) - ø5mm (5x) mm - ø3 mm (8x)	45 x 45 x 237 mm	1030-1064 nm	<0,3 mrad	29293	3000 €
						515-532 nm		29294	3000 €
						343-355 nm		29295	3200 €
						1030-1064 + 515-532 nm		29297	3200 €
						515-532 + 343-355 nm		29298	3300 €
						760-840 nm		31280	3000 €
						390-410 nm		31281	3000 €
						400 + 800 nm		31282	3200 €
						1030-1064 nm		31284	3200 €
						515-532 nm		31285	3200 €
						343-355 nm		31286	3400 €
						1030-1064 + 515-532 nm		31287	3400 €
						515-532 + 343-355 nm		31288	3500 €
						760-840 nm		31289	3200 €
						390-410 nm		31290	3200 €
						400 + 800 nm		31291	3400 €
MEX18-ACH-V2	1.0x - 8.0x continuous	11,5 mm	38 mm	ø7 mm (1x) - ø5mm (5x) mm - ø3 mm (8x)	45 x 45 x 237 mm	350-800 nm	<0,3 mrad	31283	3600 €

Mounting options for motorized beam expanders MEX

MOUNTING OPTION	FOR BEAM HEIGHT OF	SKU	PRICE
Manual 4 axis translation stage M-STAGE	27 mm (±2 mm travel)	12571	580 €



High-power motorized beam expanders MEX-HP

Main features

- High power optical design (up to 200 W @ 1030 nm, 500 fs, 1 MHz)
- No internal reflections on optical elements
- Highest beam pointing stability < 0,2 mrad
- All-in-one design with an integrated controller
- Two lens simultaneous movement assuring no misfocus
- Absolute encoder (both lenses)
- Fused silica optical elements
- Diffraction limited performance for all magnifications

Application examples

- Precise laser micromachining
- High power laser beam management
- Research

High power motorized laser beam expanders MEX series are used to increase the laser beam diameter and adjust divergence. The optical design is dedicated for high power ultrafast femtosecond laser applications. These magnification (zoom) beam expanders are designed for required wavelength and each type of beam expanders has motorized divergence adjustability. Standard or custom-made beam expanders feature a unique mechanical closed loop sliding-lens design ensuring high pointing stability and minimal dimensions.

Standard specifications

HIGH POWER MOTORIZED LASER BEAM EXPANDERS SPECIFICATIONS	
Adjustment	Motorized
Divergence	Adjustable
Lens material	UVFS
Transmission	>97% (MEX13-HP), >95% (MEX15-HP)
Control interface	USB or RS232
Controller	Integrated
Housing material	Black anodized aluminum
Max. laser power	Up to 200 W @ 1030 nm, 500 fs, 1 MHz
LIDT	3 J/cm ² (10 ns @ 355nm)
	5 J/cm ² (10 ns @ 532 nm)
	10 J/cm ² (10 ns @ 1064 nm)

*Custom design available

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	CLEAR OUTPUT APERTURE	RECOMMENDED MAX INPUT BEAM DIAMETER (I/E2)	DIMENSIONS (H X W X L)	DESIGN WAVELENGTH	POINTING STABILITY	SKU	PRICE
MEX13-HP	1.0x - 3.0x continuous	11,5 mm	28 mm	ø7 mm (1x) - ø6 mm (3x)	60 x 60 x 207 mm	1030-1064 nm	<0,5 mrad	9238	3100 €
						515-532 nm		9240	3100 €
						343-355 nm		9242	3300 €
						1030-1064 + 515-532 nm		9244	3300 €
						515-532 + 343-355 nm		9246	3400 €
						257-266 nm		31243	Request
						760-840 nm		31240	3100 €
						390-410 nm		31241	3100 €
						400 + 800 nm		31242	3300 €
						1030-1064 nm		9239	3300 €
						515-532 nm		9241	3300 €
						343-355 nm		9243	3500 €
						1030-1064 + 515-532 nm		9245	3500 €
						515-532 + 343-355 nm		9247	3600 €
						257-266 nm		31244	Request
						760-840 nm		31245	3300 €
						390-410 nm		31246	3300 €
						400 + 800 nm		31247	3500 €
MEX15-HP	1.0x - 5.0x continuous	11,5 mm	24 mm	ø7 mm (1x) - ø3,3 mm (5x)	65 x 65 x 250 mm	1030-1064 nm	<0,5 mrad	9248	3400 €
						515-532 nm		9250	3400 €
						343-355 nm		9252	3600 €
						1030-1064 + 515-532 nm		9254	3600 €
						515-532 + 343-355 nm		9256	3700 €
						257-266 nm		31251	Request
						760-840 nm		31248	3400 €
						390-410 nm		31249	3400 €
						400 + 800 nm		31250	3600 €
						1030-1064 nm		22062	3600 €
						515-532 nm		22063	3600 €
						343-355 nm		22064	3800 €
						1030-1064 + 515-532 nm		22065	3800 €
						515-532 + 343-355 nm		22066	3900 €
						257-266 nm		31252	Request
						760-840 nm		31253	3600 €
						390-410 nm		31254	3600 €
						400 + 800 nm		31255	3800 €

Mounting options for high-power motorized beam expanders MEX-HP

MOUNTING OPTION	FOR BEAM HEIGHT OF	SKU	PRICE
Manual 4 axis translation stage M-STAGE-W	27 mm (±2 mm travel)	29135	650 €



High-power motorized beam expanders MEX-HP-V2

Main features

- High power optical design (up to 200 W @ 1030 nm, 500 fs, 1 Mhz)
- No internal reflections on optical elements
- All-in-one design with an integrated controller
- Two lens simultaneous movement assuring no misfocus
- Absolute encoder (both lenses)
- Fused silica optical elements
- Adjustment time <0,7 sec (all magnifications)
- Diffraction limited performance for all magnifications
- Remotely changing focused beam spot size and its position on Z axis

What's new?

- 30% faster and more stable lens movement (<0,7 sec)
- Optimized for 24/7 usage
- Improved pointing stability <0,1 mrad or <0,3 mrad
- Redesigned Controller with Reverse polarity and Overcurrent protection

Application examples

- Industrial laser micromachining 24/7
- Precise laser micromachining
- High power laser beam management
- Research

High power motorised laser beam expanders MEX-HP-V2 series are used to increase the laser beam diameter and adjust divergence. The optical design is dedicated for high power ultrafast femtosecond laser applications. Improved lens movement speed and pointing stability ensure better control quality.

These magnification (zoom) beam expanders are designed for the required wavelength and each type of our beam expanders has motorized divergence adjustability. Standard or custom-made beam expanders feature a unique mechanical closed-loop sliding-lens design ensuring high pointing stability and minimal dimensions.

What's in the box?

- Motorised laser beam expander MEX-HP
- USB key with software and manual
- Power supply DC 12V
- USB (1,5 m) cable

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	CLEAR OUTPUT APERTURE	RECOMMENDED MAX INPUT BEAM DIAMETER (1/E ₂)	DIMENSIONS (H X W X L)	DESIGN WAVELENGTH	POINTING STABILITY	SKU	PRICE							
MEX13-HP-V2	1.0x - 3.0x continuous	11,5 mm	28 mm	ø7 mm (1x) - ø6 mm (3x)	60 x 60 x 207 mm	1030-1064 nm	<0,5 mrad	31007	3300 €							
						515-532 nm		31011	3300 €							
						343-355 nm		31015	3500 €							
						1030-1064 + 515-532 nm		31009	3500 €							
						515-532 + 343-355 nm		31013	3600 €							
						257-266 nm		31258	Request							
						760-840 nm		31259	3300 €							
						390-410 nm		31260	3300 €							
						400 + 800 nm		31261	3500 €							
						1030-1064 nm		31006	3500 €							
						515-532 nm		31010	3500 €							
						343-355 nm		31014	3700 €							
						1030-1064 + 515-532 nm		31008	3700 €							
						515-532 + 343-355 nm		31012	3800 €							
						257-266 nm		31262	Request							
						760-840 nm		31263	3500 €							
						390-410 nm		31264	3500 €							
						400 + 800 nm		31265	3700 €							
						MEX15-HP-V2		1.0x - 5.0x continuous	11,5 mm	24 mm	ø7 mm (1x) - ø3,3 mm (5x)	65 x 65 x 250 mm	1030-1064 nm	<0,5 mrad	31017	3600 €
													515-532 nm		31021	3600 €
343-355 nm	31025	3800 €														
1030-1064 + 515-532 nm	31019	3800 €														
515-532 + 343-355 nm	31023	3900 €														
257-266 nm	31266	Request														
760-840 nm	31267	3600 €														
390-410 nm	31268	3600 €														
400 + 800 nm	31269	3800 €														
1030-1064 nm	31016	3900 €														
515-532 nm	31020	3900 €														
343-355 nm	31024	4100 €														
1030-1064 + 515-532 nm	31018	4100 €														
515-532 + 343-355 nm	31022	4200 €														
257-266 nm	31270	Request														
760-840 nm	31271	3900 €														
390-410 nm	31272	3900 €														
400 + 800 nm	31273	4100 €														

Mounting options for high-power motorized beam expanders MEX-HP

MOUNTING OPTION	FOR BEAM HEIGHT OF	SKU	PRICE
Manual 4 axis translation stage M-STAGE-W	27 mm (±2 mm travel)	29135	650 €



Vertical motorized laser beam expander MEX-V

Main features

- High power optical design (up to 200 W @ 1030 nm, 500 fs, 1 Mhz)
- No internal reflections on optical elements
- High beam pointing stability <0,2 mrad
- All-in-one design with integrated controller
- Two lens simultaneous movement assuring no misfocus
- Absolute encoder (both lenses)
- Adjustment time <4 sec (all magnifications)
- Fused silica optical elements
- Diffraction limited performance for all magnifications
- No mounting limitations

Application examples

- Precise laser micromachining
- High power laser beam management
- Research

Vertical motorized laser beam expanders MEX-V series are used to increase the laser beam diameter and adjust divergence. The optical design is dedicated for high power ultrafast femtosecond laser applications. Slower and more stable lens control combines the advantages of a high-power model with the ability to be mounted vertically for greater functionality.

These magnification (zoom) beam expanders are designed for the required wavelength and each type of our beam expanders has motorized divergence adjustability. Standard or custom-made beam expanders feature a unique mechanical closed-loop sliding-lens design ensuring high pointing stability and minimal dimensions.

What's in the box?

- Motorised laser beam expander MEX-V
- USB key with software and manual
- Power supply DC 12V
- USB (1,5 m) cable

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	CLEAR OUTPUT APERTURE	RECOMMENDED MAX INPUT BEAM DIAMETER (1/E2)	DIMENSIONS (H X W X L)	DESIGN WAVELENGTH	POINTING STABILITY	SKU	PRICE
MEX15-V	1.0x - 5.0x continuous	11 mm	24 mm	ø7 mm (1x) - ø3.3 mm (5x)	80 x 80 x 245 mm	1030-1064 nm	<0.5 mrad	31165	3500 €
						515-532 nm		31167	3500 €
						343-355 nm		31169	3700 €
						1030-1064 + 515-532 nm		31166	3700 €
						515-532 + 343-355 nm		31168	3800 €
						257-266 nm		31257	Request
						760-840 nm		31170	3500 €
						390-410 nm		31171	3500 €
						400 + 800 nm		31172	3700 €
						1030-1064 nm		31157	3700 €
						515-532 nm	31159	3700 €	
						343-355 nm	31161	3900 €	
						1030-1064 + 515-532 nm	31158	3900 €	
						515-532 + 343-355 nm	31160	4000 €	
						257-266 nm	31256	Request	
						760-840 nm	31162	3700 €	
						390-410 nm	31163	3700 €	
						400 + 800 nm	31164	3900 €	



Variable beam expanders VEX and reducers VRE

Main features

- Highest beam pointing stability (< 0,5 mrad)
- Fused silica optical elements
- Grease free mechanical design
- Sliding lens design
- Diffraction limited performance for all magnifications

Application examples

- Laser micromachining
- Research

Optogama introduces variable manual beam expanders VEX series used to increase or decrease the laser beam diameter. Standard or custom-made laser beam expanders for the UV, visible, and NIR spectral ranges feature a unique mechanical sliding-lens design, ensuring a high pointing stability and minimal dimensions. These variable magnification (zoom) beam expanders are designed for the required wavelength and each type of our beam expanders have divergence adjustability.

All optical elements of beam expanders are made of fused silica with high LIDT coatings and provide stable and reliable performance even when using them with high power lasers. Large input and output apertures allow the optical beam expanders to produce diffraction limited expanded (or reduced) beams for a wide range of input beams.

Standard specifications

VARIABLE BEAM EXPANDERS AND REDUCERS SPECIFICATIONS	
Adjustment	Manual
Divergence	Adjustable
Pointing stability	<0,5 mrad, <1 mrad (VEX15-HP)
Lens material	UVFS
Transmission	>97%, >95% (VEX15-HP)
LIDT	3 J/cm ² (10 ns @ 355nm) 5 J/cm ² (10 ns @ 532 nm) 10 J/cm ² (10 ns @ 1064 nm)

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	CLEAR OUTPUT APERTURE	DESIGN	RECOMMENDED MAX INPUT BEAM DIAMETER (1/E2)	MOUNTING OPTIONS	DIMENSIONS	WAVELENGTH	SKU	PRICE
VEX13	1.0x - 3.0x continuous	11 mm	23,5 mm	Standard	ø7 mm (1x) - ø5 mm (3x)	M30x1 external, SM1 internal, ø38.1 mm [1.5"], T-mount (M42x0.75)	ø42 x 110 mm	1030-1064 nm	6985	980 €
								515-532 nm	6987	980 €
								343-355 nm	4357	1180 €
								1030-1064 + 515-532 nm	6990	1180 €
VRE13	0.33x - 1.0x continuous	22 mm	11 mm	Standard	ø15 mm (0,33x) - ø7 mm (1x)	M30x1 external, SM1 internal, ø38.1 mm [1.5"], T-mount (M42x0.75)	ø42 x 110 mm	515-532 + 343-355 nm	6991	1180 €
								1030-1064 nm	31295	980 €
								515-532 nm	6995	980 €
								343-355 nm	6997	1180 €
VEX18	1.0x - 8.0x continuous	11 mm	40 mm	Standard	ø7 mm (1x) - ø5,3 mm (5x) - ø3,3 mm (8x)	SM2, ø50.8 mm [2"]	ø53 x 203 mm	1030-1064 + 515-532 nm	6999	1180 €
								515-532 + 343-355 nm	7000	1180 €
								1030-1064 nm	6992	1190 €
								515-532 nm	6725	1190 €
VRE18	0.12x - 1.0x continuous	40 mm	11 mm	Standard	ø26 mm (0,33x) - ø7 mm (1x)	SM2, ø50.8 mm [2"]	ø53 x 203 mm	343-355 nm	6455	1390 €
								1030-1064 + 515-532 nm	6994	1390 €
								515-532 + 343-355 nm	6456	1390 €
								1030-1064 nm	31298	1190 €
VEX15-HP	1.0x - 5.0x continuous	11 mm	24 mm	High power	ø7 mm (1x) - ø3,3 mm (5x)	T-mount, SM2, ø50.8 mm [2"]	ø58 x 250 mm	515-532 nm	31301	1390 €
								1030-1064 + 515-532 nm	31302	1390 €
								515-532 + 343-355 nm	9273	2200 €
								1030-1064 + 515-532 nm	9279	2200 €
VEX15-HP	1.0x - 5.0x continuous	11 mm	24 mm	High power	ø7 mm (1x) - ø3,3 mm (5x)	T-mount, SM2, ø50.8 mm [2"]	ø58 x 250 mm	1030-1064 nm	31303	2400 €
								515-532 nm	31304	2400 €
								343-355 nm	31305	2400 €

Mounting options for motorized beam expanders VEX

DESCRIPTION	MOUNTING	WEIGHT	MOUNTING	SKU	PRICE
VEX13	75 x 28 x 100 mm	500 g	55 mm	29270	640 €
VEX18	102 x 28 x 100 mm	500 g	55 mm	29271	620 €



Fixed ratio beam expanders FEX

Main features

- Divergence adjustment
- Galilean optical design
- UVFS optical elements
- Grease free mechanical design
- Wide wavelength adoption - 200 nm to 2 μm

Application examples

- Laser material processing
- Medical
- Research

Fixed ratio beam expanders FEX series are used to increase the laser beam diameter. The FEX model diversity covers the UV, visible and NIR spectral ranges. These compact beam expanders are designed for required wavelength and have divergence adjustability. All optical elements of beam expanders are made of fused silica with high LIDT coatings and provide a stable and reliable performance even using them with high power lasers.

Standard specifications

FIXED RATIO BEAM EXPANDER SPECIFICATIONS	
Clear output aperture	23 mm
Divergence	Adjustable
Outer Diameter	30 mm
Mounting options	SM1 (male, female), ø30 mm
Transmission	>98%
LIDT	3 J/cm ² (10 ns @ 355nm) 5 J/cm ² (10 ns @ 532 nm) 10 J/cm ² (10 ns @ 1064 nm)

*Custom design available

Standard products

ITEM MODEL	EXPANSION	CLEAR INPUT APERTURE	RECOMMENDED MAX. INPUT BEAM SIZE, 1/E ²	CLEAR OUTPUT APERTURE	MECHANICAL LENGTH	WAVELENGTH	SKU	PRICE
FEX-2	2 x	11.5 mm	ø7 mm	23 mm	65 mm	343-355 nm	7723	199 €
						515-532 nm	7725	189 €
						1030-1064 nm	7727	189 €
						1030-1064 + 515-532 nm	11169	229 €
FEX-3	3 x	11.5 mm	ø5.3 mm	23 mm	65 mm	343-355 nm	7733	199 €
						515-532 nm	7731	189 €
						1030-1064 nm	7729	189 €
						1030-1064 + 515-532 nm	11170	229 €
FEX-4	4 x	11.5 mm	ø4 mm	23 mm	90 mm	343-355 nm	7735	199 €
						515-532 nm	7737	189 €
						1030-1064 nm	7739	189 €
						1030-1064 + 515-532 nm	11171	229 €
FEX-5	5 x	11.5 mm	ø3.2 mm	23 mm	95 mm	343-355 nm	7741	199 €
						515-532 nm	7743	189 €
						1030-1064 nm	7746	189 €
						1030-1064 + 515-532 nm	11172	229 €
FEX-8	8 x	7 mm	ø2 mm	23 mm	104 mm	343-355 nm	7749	209 €
						515-532 nm	7752	199 €
						1030-1064 nm	7754	199 €
						1030-1064 + 515-532 nm	11173	239 €

Mounting options for motorized beam expanders FEX

RECOMMENDED ACCESSORY	FOR BEAM HEIGHT OF	SKU	PRICE
Adapter SM1 male to M30 X 1 male	-	9338	24 €
Adapter SM1 female to C-mount	-	9339	24 €
Adapter SM1 female to M30 X 1 male	-	9340	24 €
X-Y adjustable (3 adjusters) kinematic mount with post holder	50.8 mm (2")	9341	135 €
X-Y adjustable (3 adjusters) kinematic mount with post holder	76.2 - 100 mm (3" - 4")	9342	140 €



Motorized laser power attenuators LPA

Main features

- Robust design
- Damage threshold up to 10J/cm² (10 ns @ 1064 nm)
- Adjustable polarizer angle ±2 deg
- Clear aperture 18 mm
- External controller included
- Intuitive software
- 175,543 steps in full rotation
- ± 0,05 % laser power accuracy
- Adjustment time <0,2 sec (min to max)

Application examples

- Laser machining
- Research
- Laser power control and attenuation

Optogama designs and manufactures motorized laser power attenuators for laser power control. LPA could be produced for use in the UV, visible, and NIR spectral ranges from 250 nm to 2000 nm. These devices feature a large clear aperture dedicated for considerable beam application. All optical elements of these laser power attenuators are made for high LIDT and provide a stable and reliable performance even when using them with high power lasers in industrial applications. Secondary laser beam from the laser power attenuator unit is rejected out through the output window to an external beam dump (optional) in order to avoid any thermal effects or stress in the housing of the LPA device. Exit laser beam has a 2,25 mm beam offset.

Standard specifications

MOTORIZED LASER POWER ATTENUATOR SPECIFICATIONS	
Input and output clear aperture	18 mm
Dimensions (H x W x L)	58 x 36 x 74,5 mm 58 x 51,5 x 74,5 mm with beam dump
Control interface	USB and RS232
Controller	External

*Custom design available

Standard products

ATTENUATION RANGE	LIDT	WAVELENGTH	SKU	PRICE
0,5 - 95 %	2 J/cm ² (10 ns @ 266 nm)	257 nm	9326	1550 €
		266 nm	9327	1550 €
		343 nm	9264	1420 €
0,2 - 96 %	3 J/cm ² (10 ns @ 355nm)	355 nm	9263	1420 €
		515 nm	9262	1310 €
0,1 - 98 %	5 J/cm ² (10 ns @ 532 nm)	532 nm	9260	1310 €
		1030 nm	9259	1310 €
		1064 nm	9258	1310 €

Accessories for laser power attenuators LPA

RECOMMENDED ACCESSORY	FOR BEAM HEIGHT OF	SKU	PRICE
Post mounting set	50 mm or 76 mm (2" or 3")	9343	35 €
Post mounting set	73 - 125 mm (2,9" - 5")	9344	40 €
Dedicated beam dump with protective window	-	9345	115 €



Advanced motorized laser power attenuators LPA-A

Main features

- Integrated controller
- Absolute encoder - no homing required
- High accuracy - $\pm 0,004$ deg (less than $\pm 0,01$ % of laser power)
- Resolution - 0,002 deg, 7,4 arcsec, 0,035 mrad
- Fast adjustment - less than 0,2 sec (min to max)
- High damage threshold: up to $10\text{J}/\text{cm}^2$ (10 ns @ 1064 nm)
- Adjustable polarizer angle

Application examples

- Precise laser micromachining
- Laser power control and attenuation
- Research

Advanced laser power attenuator LPA-A is a compact motorized device for laser power control with an integrated controller and absolute encoder. The LPA-A is produced in the UV, visible and NIR spectral ranges, from 250 nm to 2000 nm. This device is combined with the unique mechanical design which ensures repeatability and high stability of performance. All optical components of the LPA-A are made for high LIDT and provide a stable and reliable performance even when using them with high power lasers in industrial applications. A secondary laser beam from the laser power attenuator unit can be rejected to an external beam dump. The beam dump is used for avoiding any thermal effects or stress in the housing of the LPA-A device.

Standard specifications

ADVANCED VARIABLE MOTORIZED LASER POWER ATTENUATOR SPECIFICATIONS	
Input and output clear aperture	15 mm
Controller	Integrated
Dimensions (H x W x L)	86 x 47 x 58 mm
Control interface	USB or RS232

Standard products

ATTENUATION RANGE	LIDT	WAVELENGTH	SKU	PRICE
0.5 - 95 %	2 J/cm^2 (10 ns @ 266 nm)	257 nm	11809	1870 €
		266 nm	11810	1870 €
	5 J/cm^2 (10 ns @ 532 nm)	515+1030 nm	14898	1960 €
0.2 - 96 %	3 J/cm^2 (10 ns @ 355nm)	343 nm	11808	1730 €
		355 nm	11805	1730 €
	5 J/cm^2 (10 ns @ 532 nm)	515 nm	11807	1620 €
0.1 - 98 %	5 J/cm^2 (10 ns @ 532 nm)	532 nm	11806	1620 €
		1030 nm	11804	1620 €
	10 J/cm^2 (10 ns @ 1064 nm)	1064 nm	11708	1620 €

Accessories for laser power attenuators LPA-A

MOUNTING OPTION	FOR BEAM HEIGHT OF	SKU	PRICE
Post mounting set	76.2 - 100 mm (3" - 4")	9346	40 €
Post mounting set	57 - 65 mm (2.2" - 2.6")	9347	35 €
Dedicated beam dump with protective window	-	9345	115 €



Manual laser power attenuators LPA-M

Main features

- Industrial robust design
- Wide wavelength adoption 240 nm - 2 μm
- Cost effective

Application examples

- Laser micromachining
- Laser power attenuation
- Research

Optogama designs and manufactures industrial grade manual control laser power attenuators for use in the UV, visible, and NIR spectral ranges, from 240 nm to 2000 nm. All optical elements of these laser power attenuators are made for high LIDT and provide a stable and reliable performance even when using them with high power lasers in industrial applications.

Standard specifications

VARIABLE MANUAL LASER POWER ATTENUATOR SPECIFICATIONS	
Adjustment	Manual
Input and output clear aperture	8 mm
Dimensions (H x W x L)	57 x 72 x 105 mm

*Custom design available

Standard products

MODEL	LIDT	WAVELENGTH	SKU	PRICE
0,01 - 70%	>500 MW/cm ² 10 ns @ 1064 nm	200-300 nm	18751	1700 €
		350-2300 nm	18783	1700 €
0,5-95 %	2 J/cm ² (10 ns @ 266 nm)	257 nm	7896	850 €
		266 nm	7887	850 €
0,2-96 %	3 J/cm ² (10 ns @ 355nm)	343 nm	7885	800 €
		355 nm	7886	800 €
0,1-98 %	5 J/cm ² (10 ns @ 532 nm)	515 nm	7673	690 €
		532 nm	7672	690 €
	10 J/cm ² (10 ns @ 1064 nm)	1030 nm	7671	690 €
		1064 nm	7670	690 €



OEM laser power attenuator LPA-OEM

Main features

- Compact, cost-effective design
- Detachable controller for better integration
- 175,543 μ steps in full rotation
- ± 10 μ steps accuracy ($\pm 0,02$ deg, less than $\pm 0,05$ % of laser power)
- Fast adjustment - less than 0,2 sec (min to max)
- High damage threshold up to 10 J/cm² (10 ns @ 1064 nm)
- Adjustable polariser angle for highest contrast

Application examples

- Precise laser micromachining
- Laser power control and attenuation
- Research
- Laser integration

OEM Laser power attenuator (LPA-OEM) is a compact, cost-effective motorised laser power control unit designed for integration. The LPA-OEM is produced in the UV, visible and NIR spectral ranges, from 250 nm to 2000 nm. This device is combined with the unique mechanical design which ensures repeatability and high stability of performance. All optical components of the LPA are made for high LIDT and provide stable and reliable performance even using them with high power lasers in industrial applications.

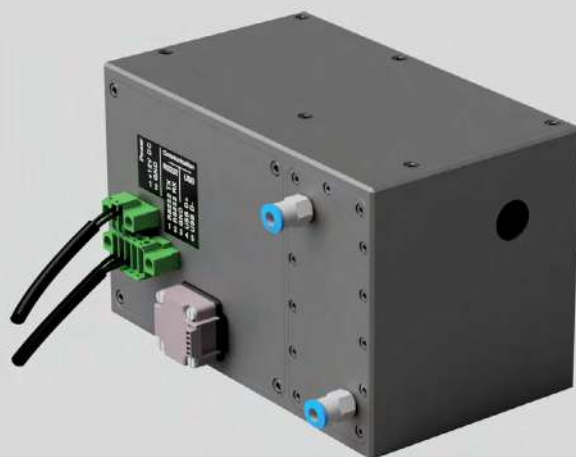
Standard specifications

LASER POWER ATTENUATOR LPA-OEM SPECIFICATIONS	
Input and output clear aperture	$\varnothing 8$ mm
Power attenuation range	<0,1% to >98%
LIDT coating	>10 J/cm ² (10 ns @ 1064 nm)
Close to open time	<0,2 sec
Resolution	175,543 μ steps in full rotation 21,943 μ steps in min/max rotation (0,002 deg, 7,2 arcsec, 0,035 mrad)
Accuracy	± 10 μ steps ($\pm 0,02$ deg, less than $\pm 0,035$ %)
Dimensions (H x W x L)	58 x 36 x 57 mm LPA-OEM 58 x 50 x 67 mm LPA-OEM with beam controller 58 x 67 x 67 mm detached controller

*Custom design available

Standard products

MODEL	ATTENUATION RANGE	LIDT (COATING)	DESIGN WAVELENGTH	SKU	PRICE
LPA-OEM	0,5 - 95%	2 J/cm ² (10 ns @ 266 nm)	257 nm	20051	1190 €
LPA-OEM	0,5 - 95%	2 J/cm ² (10 ns @ 266 nm)	266 nm	20052	1190 €
LPA-OEM	0,2 - 96%	3 J/cm ² (10 ns @ 355 nm)	343 nm	20053	1190 €
LPA-OEM	0,2 - 96%	3 J/cm ² (10 ns @ 355 nm)	355 nm	20054	1190 €
LPA-OEM	0,1 - 98%	5 J/cm ² (10 ns @ 532 nm)	515 nm	20055	1120 €
LPA-OEM	0,1 - 98%	5 J/cm ² (10 ns @ 532 nm)	532 nm	20056	1120 €
LPA-OEM	0,5 - 95%	5 J/cm ² (10 ns @ 532 nm)	515+1030 nm	20059	1280 €
LPA-OEM	0,1 - 98%	10 J/cm ² (10 ns @ 1064 nm)	1030 nm	20057	1120 €
LPA-OEM	0,1 - 98%	10 J/cm ² (10 ns @ 1064 nm)	1064 nm	20058	1120 €



Unpolarized beam motorized laser power attenuators LPA-U

Main features

- Designed for unpolarised laser beam
- Up to 200W of average laser power
- Beam offset compensated
- Integrated controller
- Absolute position encoder - no homing required
- High accuracy $\pm 0,005$ deg
- Robust design with water-cooling
- Clear aperture - $\varnothing 12$ mm
- Fast adjustment - less than 0,5 sec (min to max)
- High damage threshold: up to $10\text{J}/\text{cm}^2$ (10 ns @ 1064 nm)

Application examples

- Precise laser micromachining
- Laser power stabilization
- Research

Advanced motorised laser power attenuator LPA-U is a unique device designed for unpolarised laser power control with integrated controller and absolute position encoder.

The LPA-U is produced in the UV, visible and NIR spectral ranges, from 343 nm to 2000 nm and 10,6 μm . This device is combined with the unique mechanical robust design which ensures high repeatability.

All optical components of the LPA-U are made for high LIDT and provide stable and reliable performance even using them with high power lasers in industrial applications.

A secondary laser beam from laser power attenuator unit is rejected to an internal beam dump. Water-cooling is used for avoiding any thermal effects or stress in the housing of the LPA-U device.

Standard specifications

UNPOLARIZED BEAM MOTORIZED LASER POWER ATTENUATOR LPA-U SPECIFICATIONS

Input and output clear aperture	12 mm
Controller	Integrated
Dimensions (H x W x L)	5 x 93,5 x 135 mm
Control interface	USB or RS232

Standard products

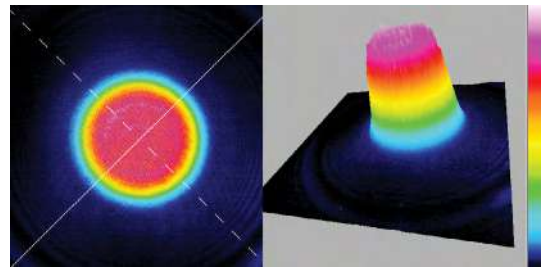
MODEL	ATTENUATION RANGE	DIMENSIONS (H X W X L)	DESIGN WAVELENGTH	SKU	PRICE
LPA-U	2 - 95%	85 x 93,5 x 135 mm	1070 nm	21710	3500 €
LPA-U	2,5 - 93%	85 x 93,5 x 135 mm	1064 nm	28839	3500 €



Flat top converter FTC

Main features

- Quick change between Gaussian and Flat-top beam
- The beam profile remains Flat-Top shape along optical axis
- Integrated controller
- Designed according your laser specs.
- Clear aperture up to 15 mm
- Quick switching time - 0.2 sec
- High damage threshold up to 10J/cm² (10 ns @ 1064 nm)
- Conversion efficiency up to 70% (while on Flat-Top mode)



Application examples

- Precise laser micromachining
- Life sciences
- Research

Flat top converter unit is "all in one" motorized solution for a Gaussian beam transformation to a Flat-Top (Top Hat) beam. The beam profile remains Flat-Top shape along optical axis. The device consists of quartz wave-plate, space-variant wave-plate and a high contrast polarizer. The FTC is produced in the UV, visible and NIR spectral ranges, from 250 nm to 2000 nm. All optical components of the FTC are made for high LIDT and provide stable and reliable performance even using them with high power lasers in industrial applications. A secondary laser beam from Flat top converter unit can be rejected to an external beam dump. The beam dump is used for avoiding any thermal effects or stress in the housing of the FTC device.

Standard specifications

FLAT TOP CONVERTER FTC SPECIFICATIONS	
Input and output clear aperture	ø15 mm (depends on waveplate)
Conversion efficiency and transmission	Up to 70 % (Flat-Top beam mode) No less than 97 % (Gaussian beam mode)
LIDT coating	>10 [J/cm ²] (10 ns @ 1064 nm)
Controller	USB and RS232
Control interface	External
Dimensions (H x W x L)	105 x 53 x 62,5 mm FTC 105 x 70 x 62,5 mm FTC with beam dump (BD-6)

*Custom design available

Standard products

MODEL	APERTURE	WAVELENGTH	ADJUSTMENT	TYPE	CONTROL INTERFACE	TYPICAL APPLICATION	SKU	PRICE
FTC	ø 6 mm	1030 nm	Motorised	DOE	USB or RS232	Flat top converter	19750	5800 €
	ø 6 mm	515 nm	Motorised	DOE	USB or RS232	Flat top converter	19751	5800 €
	ø 3 mm	1030 nm	Motorised	DOE	USB or RS232	Flat top converter	19752	4900 €
	ø 3 mm	515 nm	Motorised	DOE	USB or RS232	Flat top converter	19753	4900 €
	ø 6 mm	1064 nm	Motorised	DOE	USB or RS232	Flat top converter	19754	5800 €
	ø 3 mm	1064 nm	Motorised	DOE	USB or RS232	Flat top converter	19755	4900 €
	ø 6 mm	532 nm	Motorised	DOE	USB or RS232	Flat top converter	19756	5800 €
	ø 3 mm	532 nm	Motorised	DOE	USB or RS232	Flat top converter	19757	4900 €



Motorized polarization rotator MRO

Main features

- Compact design
- High resolution 175543 μ steps in 360 deg rotation
- High accuracy - ± 10 μ steps accuracy ($\pm 0,02$ deg)
- Clear aperture - 18 mm
- Fast adjustment - less than 0,2 sec (0 to 45 deg)

Rotator (MRO) is a compact motorized device for laser polarization control. The MRO is produced in the UV, visible and NIR spectral ranges, from 250 nm to 2000 nm. The device has external controller. All optical components of the MRO are made for high LIDT and provide stable and reliable performance even using them with high power lasers in industrial applications.

Standard specifications

SPECIFICATIONS	
Clear aperture	\varnothing 18 mm
Standard wavelengths	257 nm; 343 nm; 355 nm; 400 nm; 515 nm; 532 nm; 800 nm; 1030 nm; 1064 nm
LIDT coating	>10 [J/cm ²] (10 ns @ 1064 nm)
Close to open time (0 to 45 deg)	$< 0,2$ sec
Resolution	175,543 μ steps in full rotation 21,943 μ steps in 45deg rotation (0,002 deg, 7,2 arcsec, 0,035 mrad)
Accuracy	± 10 μ steps ($\pm 0,02$ deg)
Motor	2 phase stepper motor, 200 steps with 256 μ stepping
Mechanical dimensions	37,5 x 36 x 58 mm
Controller mechanical dimensions	125 x 53 x 31 mm
Software	LPA software

Standard products

CLEAR APERTURE	CONTROL INTERFACE	WAVEPLATE	RETARDATION	LIDT	SKU	PRICE
18 mm	USB or RS232	1064 nm	L/2	10 J/cm ² (10 ns@1064 nm)	19706	1090 €
		1030 nm	L/2	10 J/cm ² (10 ns@1030 nm)	19572	1090 €
		532 nm	L/2	5 J/cm ² (10 ns@532 nm)	19705	1090 €
		515 nm	L/2	5 J/cm ² (10 ns@515 nm)	19700	1090 €
		355 nm	L/2	3 J/cm ² (10 ns@355 nm)	19702	1130 €
		343 nm	L/2	3 J/cm ² (10 ns@343 nm)	19701	1130 €
		266 nm	L/2	2 J/cm ² (10 ns@266 nm)	19703	1130 €
		257nm	L/2	2 J/cm ² (10 ns@257 nm)	19704	1130 €
		1064 nm	L/4	10 J/cm ² (10 ns@1064 nm)	19708	1090 €
		1030 nm	L/4	10 J/cm ² (10 ns@1030 nm)	19479	1090 €
		532 nm	L/4	5 J/cm ² (10 ns@532 nm)	19709	1090 €
		515 nm	L/4	5 J/cm ² (10 ns@515 nm)	19478	1090 €
		355 nm	L/4	3 J/cm ² (10 ns@355 nm)	13527	1130 €
		343 nm	L/4	3 J/cm ² (10 ns@343 nm)	19477	1130 €
		266 nm	L/4	2 J/cm ² (10 ns@266 nm)	19711	1130 €
		257nm	L/4	2 J/cm ² (10 ns@257 nm)	19710	1130 €
				without optics	None	None



Optogama offers a variety of laser accessories designed and dedicated to enhancing your capabilities to visualize, guide and to monitor near infrared (NIR) and ultraviolet (UV) laser beams, parasitic reflections or losses in the fibers.

Compact laser pointers provide a visible reference for rough alignment and initial

setup, while our special optics positioners offer the precision and stability needed for fine-tuning laser beam alignment. These accessories ensure that laser systems perform optimally and maintain their alignment over time, which is crucial for various applications, including scientific research or industrial laser integration.

Laser accessories

r SSO -



Infrared (IR) viewers



UV-NIR laser beam visualizers



Manual 4 axis translation stage



4 axis Kinematic mount



XY industrial holders



Compact laser modules



Infrared (IR) viewers

Main features

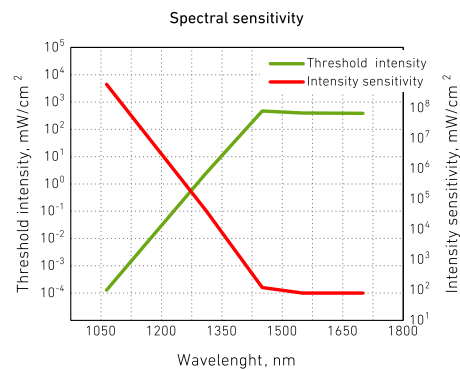
- Spectral region 400 - 1700 nm
- Resolution > 30 Lp/mm
- Hand-held / post mounted
- Up to 10 hours battery life, rechargeable
- Pulsed and CW light detection

Application examples

- Location and alignment of Nd: YAG Yb:YAG, Yb:KGW, Ti:Sapphire and other IR lasers
- Identification of stray IR reflectations
- Observation of GaAs laser diodes, IR LED's, dye and other IR-sources
- Forensic analysis on inks, pigments

The digital version of the IR viewer is based on the multiphoton absorption (MPA) phenomenon when the laser wavelength exceeds the linear spectral detection range of the silicon material.

In addition, the process of photoelectrons requires spatial and temporal filtering from noise to enhance the visualization of IR photons beyond the 1.1 μm spectrum. By adjusting the gain on a pixel-by-pixel basis, it is possible to achieve imaging up to 1.7 μm.



Standard specifications

IR-VIEWERS SPECIFICATIONS	
Resolution	>30 Lp/mm
Working distance of lens	12,5 (+/-0,2) mm
Distortion of image	<0,5 %
Battery life (continuous)	Up to 10 hours battery life, rechargeable 2x 18650 batteries
Weight	0,4 kg
Dimensions	153 x 175 x 51 mm

Standard products

FIELD OF VIEW	MAGNIFICATION	OBJECTIVE LENS	ADJUSTABLE IRIS	FOCUS	SPECTRAL SENSITIVITY	SKU	PRICE
38°	1X	F1.3/8 mm	Included	0,1 m to infinity	400 - 1700 nm	31150	2200 €
19°	2X	F1.4/16 mm	Included	0,5 m to infinity	400 - 1700 nm	31152	2200 €



UV-NIR laser beam visualizers

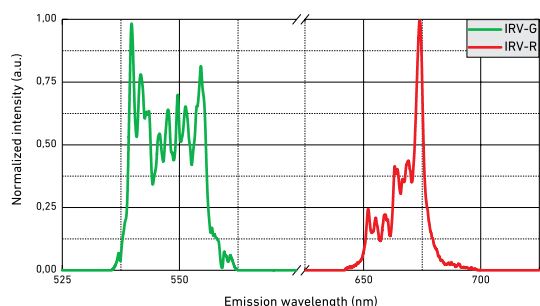
Main features

- Wavelength detection from UV to NIR
- Suitable for CW and pulsed laser light
- High sensitivity to laser radiation – 0,1 mW/mm²
- Damage threshold for pulsed laser – 1 J/cm², 10 ns
- Both sides are active

Application examples

- Laser alignment
- Research

Laser beam visualizers are designed to detect UV and IR both CW and pulsed laser light radiation. These visualizers are fabricated from aluminum with an organic polycrystal photosensitive region, which enables easy location of UV-VIS-NIR light beams and focal points. As it is not necessary to charge the active region both CW and pulsed laser light will be detected even in darkened room conditions.



Standard products

CLEAR APERTURE	ITEM MODEL	DETECTION SPECTRAL RANGE	EMISSION COLOR	THRESHOLD SENSITIVITY	SKU	PRICE
35 mm	IRV-R-1	190-1090 + 1470-1600 nm	Red	0,01 W/cm ²	7662	89 €
	IRV-G-1	880-1070 nm	Green	0,02 W/cm ²	7661	89 €



Manual 4 axis translation stage

Main features

- Sapphire contact pads
- Industrial design
- 4 axis fine adjustment
- Maximum load up to 1,5 kg

Application examples

- Motorized beam expander MEX fine adjustment
- Precise alignment of optical components and other laser accessories

MSTAGE is an industrial mounting solution for MEX compact series beam expanders. This 4-axis manual translation stage contains a locking mechanism preserving the aligned position. It features sapphire contact pads determining long-lasting and smooth micro screw operation. There are four M6 x 0,25 micro screws for adjusting platform's pitch, yaw, Y and Z axis. Two micro screws control platform's pitch and Z axis, while another two-control yaw and Y axis. All of them can be adjusted with 2 mm HEX screwdriver.

Standard specifications

SPECIFICATIONS	
Travel range	Y axis: 8 mm (±4 mm)
	Z axis: 4 mm (±2 mm)
	Yaw: ±5.5 deg
	Pitch: ±2.5 deg
Resolution	Y axis: 8 mm (±4 mm)
	Z axis: 145 µm/rev
	Yaw: 0.018 deg/rev
	Pitch: 0.010 deg/rev
Maximum load	Mounted horizontally 1.5 kg
	Mounted vertically 0.6 kg

Standard products

MODEL	DIMENSION (W X H X L)	WEIGHT	HEX SCREWDRIVER	SKU	PRICE
M-STAGE	75 x 28 x 100 mm	500 g	3mm, 2mm, 1.5 mm HEX	12571	580 €
M-STAGE-W	102 x 28 x 100 mm	650 g	3mm, 2mm, 1.5 mm HEX	29135	650 €



4 axis Kinematic mount

Main features

- Sapphire contact pads
- Locking mechanism of all 4 axis
- Industrial design
- 4 axis fine adjustment
- Maximum load up to 1 kg

Application examples

- Variable beam expander VEX fine adjustment
- Industrial mounting of other laser accessories

KMOUNT is an industrial mounting solution for VEX manual variable beam expanders.

This 4-axis manual kinematic mount contains a locking mechanism preserving the aligned position on all 4 axis. It features sapphire contact pads determining long-lasting and smooth micro screw operation.

There are 2x M6 x 0,25 and 2x 3/16"-100 micro screws for adjusting the platform's pitch, yaw, Y, and X-axis.

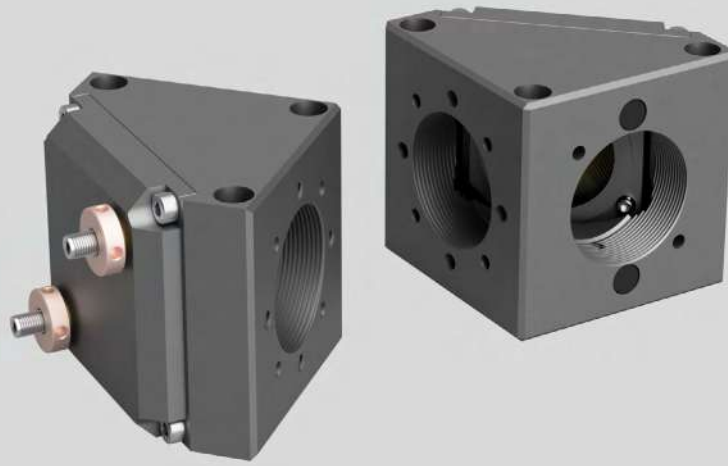
Two micro screws control platform's tilt, while another two-control XY axis. All of them can be adjusted with a 2 mm HEX screwdriver.

Standard specifications

SPECIFICATIONS	
Travel range	Y axis: 8 mm (± 4 mm)
	Z axis: 4 mm (± 2 mm)
	Yaw: ± 5.5 deg
	Pitch: ± 2.5 deg
Resolution	Y axis: 8 mm (± 4 mm)
	Z axis: 145 $\mu\text{m}/\text{rev}$
	Yaw: 0.018 deg/rev
	Pitch: 0.010 deg/rev
Maximum load	Mounted horizontally 1 kg

Standard products

DESCRIPTION	MOUNTING	WEIGHT	MOUNTING	SKU	PRICE
VEX13	75 x 28 x 100 mm	500 g	55 mm	29270	640 €
VEX18	102 x 28 x 100 mm	500 g	55 mm	29271	620 €



XY industrial holders

Main features

- Sealed industrial design
- Reflection or Refraction + Transmission design
- Attaches together at any direction
- 3 axis fine adjustment
- Combines with sealing tubes for enclosing laser path

Application examples

- Precision optics mounting
- "Closed" optical system
- High power laser beam guiding
- Beam delivery systems

XY-IND are 2-axis and 3-axis sealed industrial kinematic mirror/splitter mounts. It combines with sealing tubes in both ends for optics and laser beam path protection from dust and environment. The mounts are easily attached together at any direction.

There are two types of holders:

- 2-axis and 3-axis Reflection type - is typically used with mirror.
- 3-axis Reflection + Transmission type - is typically used for splitting or filtering the laser beam.

Standard specifications

SPECIFICATIONS	
Angular range	±3,2 deg
Z axis*	±1,75 mm
Clear aperture	∅ 16 mm (reflection type) ∅ 12 mm (transmission type)
Max. recommended beam size	∅ 14 mm (reflection type) ∅ 10 mm (transmission type)
Max. recommended beam size 1/e2	∅ 10 mm (reflection type) ∅ 8 mm (transmission type)
Fits	∅ 25,0-25,4 mm (1,0"), 2-5 mm thickness
Angular	0,45 deg/rev 8 mrad/rev
Z axis	254 µm/rev
Adjustment microscrew	2 mm HEX

Standard products

DESCRIPTION	ITEM MODEL	MATERIAL	DIMENSIONS	SKU	PRICE
XY holders (Reflection)	XYIND-2R-B	Black anodized aluminium	50 x 50 x 50 mm (H x W x L)	20020	135 €
XYZ holders (Reflection)	XYIND-3R-B	Black anodized aluminium	50 x 50 x 50 mm (H x W x L)	20021	149 €
XYZ holders (Reflection / Transmission)	XYIND-3RT-B	Black anodized aluminium	50 x 50 x 50 mm (H x W x L)	20022	175 €
XYZ holders (Reflection)	XYIND-2R-N	Natural anodized aluminium	50 x 50 x 50 mm (H x W x L)	29094	135 €
XYZ holders (Reflection)	XYIND-3R-N	Natural anodized aluminium	50 x 50 x 50 mm (H x W x L)	29095	149 €
XYZ holders (Reflection / Transmission)	XYIND-3RT-N	Natural anodized aluminium	50 x 50 x 50 mm (H x W x L)	29096	175 €
Holder locking nuts (2 pcs)	XYIND-2-LOCKS	Bronze	12,5 x 3,8 mm (D x T)	28250	16,9 €
Holder locking nuts (3 pcs)	XYIND-3-LOCKS	Bronze	12,5 x 3,8 mm (D x T)	28251	25,5 €
Tube seal with o-ring	XYIND-SEAL-SM1-B	Black anodized aluminium	32 x 24 mm (D x L)	28252	19 €
Tube seal with o-ring	XYIND-SEAL-SM1-N	Natural anodized aluminium	32 x 24 mm (D x L)	29092	19 €
Tube joint with o-ring	XYIND-TUBE-JOINT-B	Black anodized aluminium	32 x 40 mm (D x L)	28253	27 €
Tube joint with o-ring	XYIND-TUBE-JOINT-N	Natural anodized aluminium	32 x 40 mm (D x L)	29093	27 €
Sealing tube	XYIND-TUBE-N-1	Natural anodized aluminium	22 x 1000 mm (D x L)	28254	18 €
Sealing tube (custom length)	XYIND-TUBE-N-C05	Natural anodized aluminium	22 x 0 ... 500 mm (D x L)	28255	18 €
Sealing tube (custom length)	XYIND-TUBE-N-C051	Natural anodized aluminium	22 x 500 ... 1000 mm (D x L)	28256	28 €
Sealing tube	XYIND-TUBE-B-05	Black anodized aluminium	22 x 500 mm (D x L)	28257	25 €
Sealing tube (custom length)	XYIND-TUBE-B-C025	Black anodized aluminium	22 x 0 ... 250 mm (D x L)	28258	25 €
Sealing tube (custom length)	XYIND-TUBE-B-C02505	Black anodized aluminium	22 x 250 ... 500mm (D x L)	28259	35 €



Compact laser modules

Main features

- Industrial design
- 2 axis fine adjustment
- Locking mechanism of all 2 axis

Application examples

- Beam alignment
- Demonstration of laser systems

The compact laser module (CLM) is a precision-engineered optical tool designed to operate at 520 and 635 nm wavelengths. Offering adjustable beam control, with $\pm 3^\circ$ pointing angle, < 1 mrad beam divergence, and 4,5 mW of average power. It can be used in laser system alignment, optical experimentation, and educational demonstrations, providing reliability in a compact package.

Standard specifications

SPECIFICATIONS	
Operation wavelength	520, 635 nm
Mode of operation	CW
Average output power	4,5 \pm 3 mW
Beam mode	Single mode
Beam diameter	4 mm
Beam divergence	< 1 mrad
Operating temperature	-10°C to +50°C
Electrical power consumption	3-5 V AC, < 160 mA
Laser head size (L x W x H)	39 x 27 x 41 mm
Pointing adjustment	$\pm 3^\circ$
Degree per rotation	0,5°/rotation

Standard products

WAVELENGTH	AVERAGE POWER	BEAM DIAMETER	LASER HEAD SIZE (L X W X H)	PONTING ADJUSTMENT	SKU	PRICE
520 nm	4,5 \pm 0,3 mW	4 mm	39 x 27 x 41 mm	$\pm 3^\circ$	31037	590 €
635 nm	4,5 \pm 0,3 mW	4 mm	39 x 27 x 41 mm	$\pm 3^\circ$	31038	590 €

General Terms and Conditions of Sale

Orders may be placed by regular mail, e-mail or fax to:

Optogama
Mokslininku str. 6B
LT-08412, Vilnius, LITHUANIA

Phone: +370 5 219 4884
Fax: +370 5 219 4883
E-mail: sales@optogama.com

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All price quotations are subject to confirmation and are non-binding. Unless otherwise agreed to by Optogama in writing, and all prices for the sale of Product are stated in and to be paid in € (Euro).

For the orders below 200 € additional documentation and handling fee may be applied.

All payments are due and payable in thirty (30) days from date of invoice. Optogama reserves the right to require alternative payment terms, including without limitation letter of credit or payment in advance.

Payments not made by the due date shall be subject to a late payment charge of the lesser of 0,2 % per day or the maximum rate permitted by law. Bank fees associated with payment should be paid by the Buyer.

Payment can be made by wire transfer or credit card.

Wire transfer details:

Account number (IBAN): LT88 7044 0600 0802 0123
Bank name:
AB SEB Bankas, address: Konstitucijos Ave. 12, LT-01103 Vilnius, LITHUANIA
SWIFT Code: CBVI LT 2X
Beneficiary:
Optogama UAB, address: Mokslininku str. 6B, LT-08412 Vilnius, LITHUANIA

Payment using PayPal, credit, or debit card:

Your payment will be processed through PayPal payment system. PayPal allows you to make payments using a variety of methods including: PayPal Cash or PayPal Cash Plus account balance, a bank account, PayPal Credit, debit or credit cards, and rewards balance.

Please request Proforma Invoice for advanced payment. PayPal payment fee: 4% from total order amount + delivery costs.

2. Delivery and delays

Delivery dates noted on the Order Confirmation are subject to reasonable adjustment. The acceptance of shipment by a common carrier or by any licensed public truckman shall constitute proper delivery.

In case Optogama is unable to deliver ordered goods in time, Optogama shall notify buyer of this and at the same time, if possible, provide buyer with information on expected delivery date.

Optogama shall not be responsible for any loss suffered by buyer, including loss on operations, loss of profits or other indirect losses as a result of the delay in delivery, and consequently Optogama shall not compensate buyer for any of such loss.

Optogama reserves the right to deliver Products on DAP (Incoterms 2010) basis by DHL, UPS, TNT, FedEx or other forwarders and request to cover delivery charges by the Buyer.

3. Limited warranty and liability

All products are guaranteed to be free from defects. Claims are accepted for a period of three months after delivery. We do not assume liability for installation, labor, or consequential damages.

Optogama shall not be liable for any defects or losses suffered by buyer, including loss on operations, loss of profits or other indirect losses as a result of the defects, and consequently Optogama shall not compensate buyer for any of such loss.

Consequently, Optogama shall have no liability for any personal injury, property damage or other loss based on the use of the product in combination with or integrated into any other instrument or device. However, if Optogama is held liable, whether directly or indirectly, for any loss or damage arising under this limited warranty or otherwise, regardless of cause or origin, Optogama maximum liability shall not in any case exceed the purchase price of the product which shall be the complete and exclusive remedy against Optogama.

4. Product return or repair

Buyer will notify Optogama about the occurrence of defective or non-operational Product and request a Return Authorization Number (RMA) from Optogama for the items Buyer would like to return for repair or replacement by email. This RMA number is to be used for all correspondence and shipping documents that relate to the Product. Buyer will ship the defective or non-operational Product to Optogama. Buyer is responsible for shipping cost.

Upon receipt of the returned Product, Optogama will test the Product to verify the defective status of the component within the terms of the Limited Warranty and communicate such results to Buyer.

Optogama will either send a repaired or replacement Product after verifying that the Product returned under the RMA number is in fact defective within the terms of the Limited Warranty. Optogama is responsible for shipping costs of replacement Product to the Buyer.

