Shalom EO
Crystals, optics and components

One-stop off-the-shelf optical component supplier

Optics, crystals and optical components

Optics

Wafers

Optical Filters

Laser crystals and components

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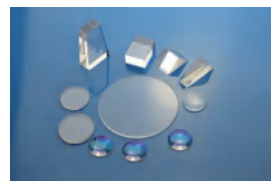

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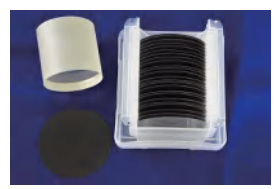

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01 Laser Crystals and components

Laser Crystals and components

Laser crystals, nonlinear crystals and laser optics are essential parts in laser systems or laser applications. Laser crystals are used as a medium to generate laser light when it is pumped by an energy source, nonlinear crystals have functioned as harmonic generations or frequency conversion, optical parametric oscillator, Q-switches, etc. for laser light. Laser Lenses are designed to focus, homogenize, or shape laser beams. Laser Mirrors are for beam steering and Laser Windows are used to transmit designated wavelengths and protect sensitive components from stray light. Laser Filters transmit or reflect a portion of the laser light, Polarizers and waveplates are used to alter the polarization state of laser light.

Hangzhou Shalom EO offers a wide variety of laser optical components, off-the-shelf and customs products are both available. Series laser parts for Nd:YAG lasers, ultra-fast femtosecond lasers, fiber lasers, CO2 lasers are also available.

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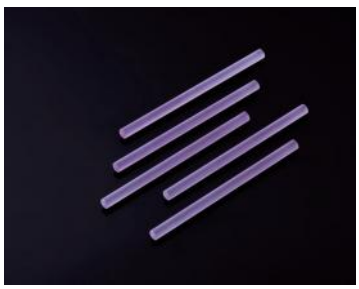
Laser Crystals



"Laser" is an acronym for "light amplification by stimulated emission of radiation", when the laser gain medium is pumped by an external energy source, it is excited and emits a light beam, and then the beam is reflected in the optical cavity to generate coherent laser light. The light emission is the result of the photons radiated through electronic or molecular transitions. The laser medium can be in the form of a solid, gas, liquid, or semi-conductor. Laser crystals are a kind of solid-state laser gain media. Laser crystals are often doped with various kinds of ions (often trivalent rare earth ions or transition metal ions), these ions facilitate the amplification of light at laser wavelengths. Common geometries of these crystals include cuboid, cylindrical, and thin disk. The shape of the crystal and the doping percentage have great influences on the output laser beam. Compared with laser glass materials, the merits of laser crystals are manifold, including higher transition cross-sections, a smaller absorption and emission bandwidth, better thermal properties, and possible birefringence.

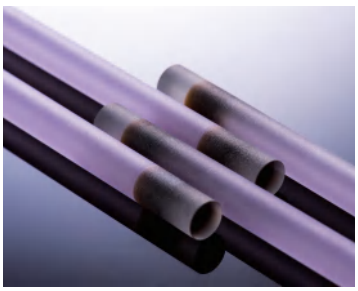
Hangzhou Shalom EO offers a rich selection of laser crystals, including Nd: YAG, Nd: Ce: YAG, Nd: YVO4, CTH: YAG, Er: YAG, Yb: YAG, Ti: Sapphire, Alexandrite crystals and diffusion bonding crystals. Nd: YAG and Nd: YVO4 are popular crystals for 1064nm lasers, Nd: Ce: YAG, CTH: YAG, and Er: YAG crystals are often used in the medical and cosmetic lasers, Ti: Sapphire is for ultra-fast lasers, Alexandrite is for long-pulsed and picosecond 755nm lasers, diffusion bonding crystals are useful for OEM compact lasers.

Laser Crystal Comparison

Crystal	Chemical Formula	Laser Wavelength	Loss Coefficient	Pump Wavelength	Thermal Conductivity	Thermal Expansion Coefficient
Nd:YAG Crystals	Nd:Y3A15O12	1064nm	0.003 cm-1 @ 1064 nm	807.5nm	14W/m/K(@20°C) and 10.5W/m/K(@100°C)	[111]Direction:7.8×10-6 /°C(0~250°C)
Nd:YVO4 Crystals	Nd3+:YVO4	1064nm,1342nm	0.02cm-1@1064nm	808nm	5.2W/m/K(@25°C)	a = 4.43, c= 11.4（10-6·K-1@25°C）
Nd:Ce:YAG Laser Crystals	Nd3+: Ce3+: Y3Al5O12	1064nm	<0.003cm-1@1064nm	808nm	11.7W/m/K(@20°C)	1.5X10-6 /°C(@20°C)
CTH:YAG	Cr3+,Tm3+,Ho3+:Y3Al5O12	2080nm	/	780nm	14W/m/K(@20°C) 10.5W/m/K(@100°C)	[100]Direction:8.2x10-6 /°C(0~250°C) [110]Direction:7.7x10-6 /°C(0~250°C) [111]Direction:7.8x10-6 /°C(0~250°C)
Er:YAG	Er3+:Y3Al5O12	2940nm	<0.003cm-1@1064nm	600-800nm	0.12W/m/K(@20°C)	9.5（10-6/°C@20°C）
Yb:YAG Crystals	Yb:Y3Al5O12	1030nm	0.003cm-1	940nm	14W/m/K(@20°C) 10.5W/m/K(@20°C)	[100]Direction:8.2x10-6 /°C(0~250°C) [110]Direction:7.7x10-6 /°C(0~250°C) [111]Direction:7.8x10-6 /°C(0~250°C)
Ti:Sapphire Crystals	Ti3+: Al2O3	600-1050nm	/	532nm	52 W/m/k	5×10-6 K-1
Alexandrite Crystals	Cr3+:BeAl2O4	700-855nm	0.06%cm-1	630-685nm	23 W/m/K	5.9(a), 6.1(b), 6.7(c)x10-6·K-1

Diffusion Bonding Laser Crystals





- Various combination options
- Enhancement of power scalability, power efficiency, and beam quality of lasers
- Reduction of thermal lensing effect and the potential for mechanical fracture
- Minimizing the complexity of laser modules

Diffusion Bonding Crystals are composite laser crystals consisting of two, three, or more parts crystals with different doping characteristics, where the constituent parts are combined through a technique called diffusion bonding, that is, the diffusion of atoms across their interface. There are various approaches to bonding the crystals, including composite crystals with different dopants, undoped end caps on a short laser rod, crystal plates with different doping concentrations, etc. Compared with normal laser crystals, diffusion bonding laser crystals are conducive to the enhancement of power scalability, power efficiency, beam quality of lasers, and the improvement of mechanical and thermal properties. Furthermore, this diffusion bonding technique can not only upgrade the overall laser performance to a significant extent but is also beneficial to the simplification of laser modules, granting access to compact designs.

Hangzhou Shalom EO provides a copious selection of diffusion bonding crystals. Various dimensions, doping percentages, and coatings could be tailored upon requests.

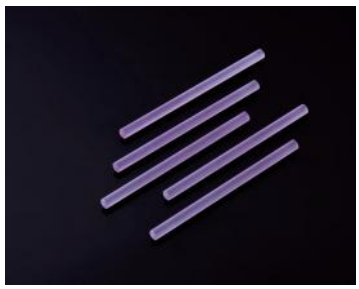
Following diffusion bonding crystals are available in Hangzhou Shalom EO:

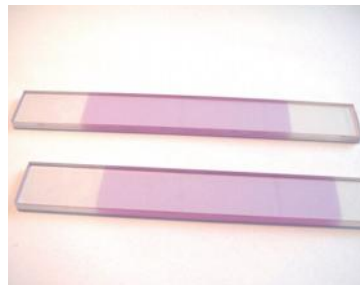
Bonding Crystal Combinations	Doping Concentration(atm) or Optical Density (cm-1)	Aperture (mm)	Length (mm)
YAG+Nd :YAG	Nd:0.6~1.2%	2×2~20×20	2~200
YAG+Cr4+ :YAG	0.6~7	2×2~20×20	2~50
Nd :YAG + Cr4+:YAG	Nd:0.6~1.2% / 0.6~7	2×2~20×20	2~200
YAG+Nd :YAG+YAG	Nd:0.6~1.2%	2×2~20×20	3~200
YAG+Nd:YAG+Cr4+:YAG	Nd:0.6~1.2% / 0.6~7	2×2~20×20	3~200
YAG+Nd:YAG+Cr4+:YAG+YAG	Nd:0.6~1.2% / 0.6~7	2×2~20×20	5~200
Cr:YAG+Nd:Ce:YAG	0.6-7/Nd:0.9~1.3% Ce:Nd=1:10	2x2~10x10	5~130
YAG+Cr4+:YAG+Nd:Ce:YAG+YAG	0.6~7/Nd:0.9~1.3%, Ce:Nd=1:10	2×2~10×10	5~130
YVO4+Nd:YVO4+YVO4	Nd:0.1~3%	2x2~10x10	1~20
YVO4+Nd:YVO4+YVO4	Nd:0.1~3%	Dia2~10	3~20

Following diffusion bonding crystals are available in Hangzhou Shalom EO:

Damage	≤ 3.0 × 10-3 cm-1	Flatness	< λ/10
Parallelism	≤ 10"	Perpendicularity	≤ 5′
Surface Quality	10/5 S/D (MIL-O-13830A)	Optical Quality	Interference fringes ≤ 0.125/inch
Size	Diameter: 2 ～ 18 mm, Length 3 ～ 200 mm	Dimensional Tolerances	Diameter:+0.000/-0.05mm, Length ± 0.5mm Chamfer:<0.1 mm @ 45°
Coating	Upon request of customer		

Nd:YAG Crystals





- Wide doping range: 0.1-2.0 atm%
- Nd:YAG Rods, plates and disks optional
- Grooved barrel and convex end-surface available
- Coating Options: AR@1064nm, PR@1064nm and HR@1064nm, HR@1064&HT@808nm,
- HR@1064&HR@532nm and customized
- Nd:YAG rods refurbishing service (re-polishing and re-coating) available

Neodymium Doped Yttrium Aluminum Garnet - Nd:YAG laser crystals has been and would continue to be the most popular lasing media for solid-state lasers. Good fluorescence lifetime, thermal conductivity and robust nature make Nd:YAG laser crystals suitable for high power continuous wave, high intensity Q-switched and single mode operation. Hangzhou Shalom EO offers the standard Nd:YAG rods with AR coating at 1064nm and the customized rods or crystals upon customer's special request.

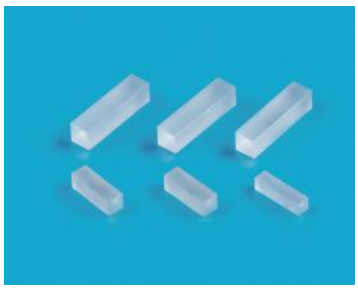
Specifications:

Orientation	<111> or <100> within 5 degree	Wavefront Distortion	≤Lambda/8 @ 633nm
Extinction Ratio	≥28 dB	Parallelism	≤ 10 arc second
Perpendicularity	≤ 5 arc minute	Flatness	≤ Lambda/10 @ 633nm
Surface Quality	10/5 S/D (per MIL-O-13830A)	Chamfer	<0.1mm x 45 degree

Physical and Optical Properties:

Laser Wavelength	1064nm	Stimulate Emission Cross Section	2.8x10-19cm-2
Relaxation Time of Terminal Lasing Level	30 ns	Radiative Lifetime	550 ms
Spontaneous Fluorescence	230 ms	Loss Coefficient	0.003 cm-1 @ 1064 nm
Effective Emission Cross Section	2.8 x 10-19cm2	Linewidth	0.6 nm
Index of Refraction	1.82	Pump Wavelength	807.5nm
Chemical Formula	Nd:Y3A15O12	Crystal Structure	Cubic
Lattice Parameters	12.01Å	Concentration	~ 1.2 x 1020 cm-3
Melting Point	1970℃	Mohs Hardness	8.5
Density	4.56g/cm3	Thermal Expansion Coefficient	[111]Direction:7.8×10-6 /℃ (0~250℃)
Thermal Conductivity	14W/m/K(@20℃) and 10.5W/m/K(@100℃)		

Nd:YVO4 Crystals





- High damage threshold
- Great absorption coefficient, wide absorption bandwidth
- Excellent optical and mechanical properties
- Large emission cross-section and uniaxial birefringence
- Wide doping concentration range: 0.1% to 3%
- Maximum size: Φ20x20mm

Neodymium-doped Gadolinium Vanadate or Nd: YVO4 crystal is one of the most efficient laser host crystals among the current commercial laser crystals for DPSS lasers, in particular, low to middle power diode pumping attributing to its absorption and emission features surpassing Nd:YAG. Its large stimulated emission cross-section at the lasing wavelength, high absorption coefficient and wide absorption bandwidth at the pump wavelength all contribute to its excellence. Whilst Nd:YVO4 also boasts high damage threshold as well as exceptional physical, optical, and mechanical properties.

Hangzhou Shalom EO offers the Nd: YVO4 with an Nd doping range of 0.1%-3% and with a maximum size of Dia20x20mm.

Nd:YVO4's advantages over Nd: YAG:

With an absorption efficiencies five times greater across a broad pumping bandwidth centered around 808nm, the reliance on pumping wavelength diminishes, favoring a pronounced inclination towards single-mode output.
The emission cross-section at the lasing wavelength of 1064nm is three times larger
Lower lasing thresholds and enhanced slope efficiencies
As a uniaxial crystal with substantial birefringence, Nd:YVO4 crystals ensure linear polarization of the emitted light

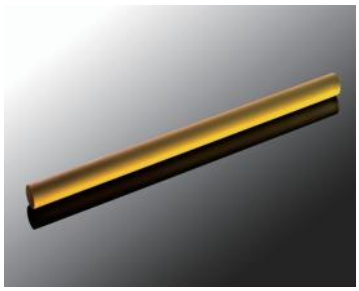
Specifications:

Transmitting Wavefront Distortion	less than λ/4 @ 633nm	Clear Aperture	>90% central area
Chamfer	≤0.2mm@45degree	Chip	≤0.1mm
Flatness	λ/8 @ 633 nm	Surface Quality	10/5 S/D
Parallelism	better than 10 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	≤0.5°	Quality Warranty Period	one year under proper use
Typical Coating	AR@1064nm&HT@808nm, HR@1064nm&HT@808nm	Damage Threshold	700MW/cm^2@1064nm, 10Hz, 10ns

Physical and Optical Properties:

Atomic Density	1.26x1020 atoms /cm3 (Nd1.0%)	Crystal Structure	Zircon Tetragonal, space group D4h-I4/amd
Density	4.22g/cm3	Mohs Hardness	4-5(Glass-like)
Thermal Expansion Coefficient (300K)	αa=4.43x10-6 /K αc=11.37x10-6 /K	Thermal Conductivity Coefficient (300K)	//C:0.0523W/cm/K ⊥ C:0.0510W/cm/K
Lasing Wavelength	1064nm,1342nm	Thermal Optical Coefficient (300K)	dno/dT=8.5×10-6 /K dne/dT=2.9×10-6 /K
Stimulated Emission Cross-section	25×10-19cm2 @ 1064nm	Thermal Optical Coefficient (300K)	dno/dT=8.5×10-6 /K dne/dT=2.9×10-6 /K
Stimulated Emission Cross-section	25×10-19cm2@ 1064nm	Fluorescent Lifetime	90μs(1% Nd doping)
Absorption Coefficient	31.4cm-1@810nm	Intrinsic Loss	0.02cm-1@1064nm
Gain Bandwidth	0.96nm@1064nm	Polarized Laser Emission	π polarization; parallel to optic axis(c-axis)
Diode Pumped Optical to Optical Efficiency	>60%	Sellemeier equations (λ in μm)	n02=3.77834+0.069736/(λ2-0.04724)-0.010813λ2 ne2=4.59905+0.110534/(λ2-0.04813)-0.012676λ2

Nd:Ce:YAG Crystals



- Low lasing threshold
- High efficiency
- Good thermal stability
- High optical property
- Excellent UV radiation resistance

Nd:Ce:YAG crystal is an excellent laser gain media used for non-water-cooled lasers and miniature laser systems. With the cerium ions doped as sensitizers for the Nd ions, thermal distortion is reduced and laser output power is higher than that of the Nd:YAG crystals with the same pumping source, permitting high power density with superior beam quality. The (Nd, Ce): YAG laser rod we produce has the characteristics of high efficiency, low lasing threshold, excellent UV radiation resistance, and high repetition frequencies for laser operation. Nd:Ce:YAG laser crystal is an ideal laser material for high repetition air cooling lasers. It is suitable for different modes of operation (CW, pulsed, Q-switched, mode-locked, frequency-doubled) and high-average power lasers.

Hangzhou Shalom EO offers Nd:Ce:YAG crystals, different doping concentrations and specifications are available for selection.

Specifications:

Dopant Concentration	Nd: 0.9-1.3 atm %, Ce : Nd=1:10	Orientation	<111> crystalline direction within 5℃
Flatness	<λ/10	Parallelism	≤10 arc seconds
Perpendicularity	≤5 arc minutes	Surface Quality	10/5 S/D MIL-O-13830A
Optical Quality	Interference fringes ≤ 0. 25 λ /inch Extinction ration ≥ 30dB	Size	Diameter: 3~8mm, Length: 40~80mm Upon request of customer
Dimensional Tolerances	Diameter: +0.000"/-0.05" Length: ±0.5"	AR-Coating Reflectivity	≤ 0.2% (@1064nm)

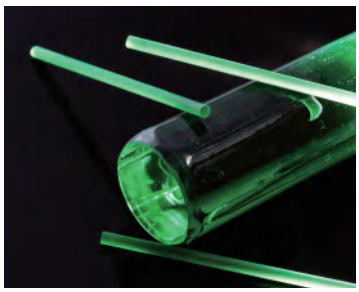
Physical and Chemical Properties:

Chemical Formula	Nd3+: Ce3+: Y3Al5O12	Crystals Structure	Cubic
Lattice Parameters	12.01Å	Melting Point	1970℃
Moh Hardness	8.5	Density	4.56 ± 0.04g/cm3
Specific Heat(0-20)	0.59J/g.cm3	Modulus of Elasticity	310Gpa
Young's Modulus	3.17×104Kg/mm2	Poission Ratio	0.3(est.)
Tensile Strength	0.13~0.26Gpa	Thermal Expansion Coefficient	[100]:8.2 × 10-6 /℃ [110]:7.7 × 10-6 /℃ [111]:7.8 × 10-6 /℃
Thermal Conductivity	14W/m/K(@25℃)	Thermal Optical Coefficient (dn/dT)	7.3×10-6 /℃
Thermal Shock Resistance	790W/m		

Specifications:

Laser Transition	4F3/2 --> 4I11/2	Laser Wavelength	1.064μm
Photon Energy	1.86×10-19J@1.064μm	Emission Linewidth	4.5A @1.064μm
Emission Cross Section	2.7~8.8×10-19cm-2	Fluorescence Lifetime	230μs
Index of Refraction	1.8197@1064nm		

CTH:YAG Crystals



- Eye-safe wavelength of 2.1 μm
- High slope efficiency
- Excellent operation at room temperature
- Pumping source options: flash lamp or laser diode
- Ideal for medical lasers, laser cutting and welding, and scientific research applications.

Cr:Tm:Ho:YAG, CTH:YAG is a kind of excellent laser crystal emitting at 2.1um wavelength. The addition of cerium as a dopant in the YAG crystal matrix enhances certain performance aspects. Due to its advantages including high slope efficiency, fitness for operation at room temperature, and output eye-safe wavelength laser light, CTH: YAG crystals find widespread applications in various laser systems, including solid-state lasers used in medical procedures (such as dermatology and ophthalmology), laser cutting and welding, and scientific research applications. Hangzhou Shalom EO offers the CTH:YAG rods tailored upon customers' request.

The Advantages of CTH: YAG:

High Thermal Conductivity
Wide Transparency Range
High Optical Homogeneity and Low Scattering
Chemical and Mechanical Stability
High Damage Threshold
Efficient Energy Conversion

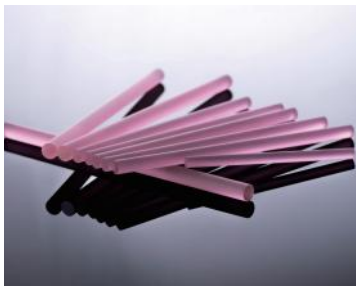
Specifications:

Cr Concentration	0.85%	Tm Concentration	5.90%
Ho Concentration	0.36%	Wavefront Distortion (Per inch of rod length)	<l/2
End Face Parallelism	<10 arc seconds		230μs

Physical and Optical Properties:

Crystal Structure	Cubic	Lattice Parameters	12.01 Å
Melting Point	1970℃	Moh Hardness	8.5
Density	4.56g/cm3	Specific Heat (0-20)	0.59J/g.cm3
Modulus of Elasticity	310GPa	Poisson Ratio	0.3(est.)
Tensile Strength	0.13~0.26GPa	Thermal Expansion Coefficient	[100]Direction:8.2x10-6 /C°(0~250℃) [110]Direction:7.7x10-6 /C°(0~250℃) [111]Direction:7.8x10-6 /C°(0~250℃)
Thermal Conductivity	14W/m/K(@20℃) 10.5W/m/K(@100℃)	Thermal Optical Coefficient (dn/dT)	7.3x10-6 /C°
Thermal Shock Resistance	790W/m	Solubility	Water: Insoluble; Common Acids: Slightly
Laser Transition	5I7 - 5I8	Laser Wavelength	2.097μm
Photon Energy	9.55 x 10-20 J	Emission Cross Section	7 x 10-21 cm2
Fluorescence Lifetime	8.5 ms	Index of Refraction	1.80 @2.08μm
Absorption Linewidth	4nm	Diode Pump Band	781nm
Major Pump Bands	400~800nm		

Er:YAG Crystals



- High slope efficiencies
- High damage threshold
- Eye-safe laser wavelength 2.94μm
- Excellent for cosmetic and medical lasers

Erbium-doped yttrium aluminum garnet or Er:YAG crystals is an excellent laser crystal that emits laser light of 2.94 μm, this wavelength holds the distinction of being the most absorbable by water among all existing wavelengths and is considered an efficient surface-cutting laser. The 2.94μm wavelength is an eye-safe wavelength, which renders Er:YAG crystals suitable for medical applications such as dental, orthopedics, etc.

Specifications:

Dopant Concentration	Er: ~50 at%	Wavefront Distortion	≤0.125λ/inch(@1064nm)
Extinction Ratio	≥25 dB	Rod Sizes	Diameter:3~6mm, Length:50~120 mm Upon request of customer
Dimensional Tolerances	Diameter:+0.000"/-0.002"Length: ± 0.02"	Barrel Finish	Fine Ground
Parallelism	≤10"	Perpendicularity	≤5′
Flatness	λ/10	Surface Quality	10/5(MIL-PRF-13830B)
AR Coating Reflectivity	≤ 0.25% (@2940nm)		

Basic Properties:

Physical and Optical Properties:

Laser Transition	4I11/2to4I13/2	Laser Wavelength	2940nm
Photon Energy	6.75×10-20J(@2940nm)	Emission Cross Section	3×10-20cm2
Index of Refraction	1.79 @2940nm	Pump Bands	600~800 nm

Yb:YAG Crystals



- low frictional heating
- superb slope efficiencies
- Broad absorption bands, about 8nm@940nm
- Conveniently pumped by reliable InGaAs diodes at 940nm(or 970nm)
- High thermal conductivity and large mechanical strength
- High optical quality

Ytterbium-doped yttrium aluminum garnet or Yb:YAG is a laser media used in DPSS laser of superior overall performance. It is more suitable for diode-pumping than the traditional Nd-doped materials. It can be pumped at 0.94μm. Compared with the common Nd:YAG crystal, Yb:YAG crystal has a much larger absorption bandwidth to reduce thermal management requirements for diode lasers, a longer upper-state lifetime, and three to four times lower thermal loading per unit pump power. Yb:YAG crystal is expected to replace Nd:YAG crystal for high-power diode-pumped lasers and other potential applications.

Specifications:

Yb-dopant Concentration	0.2%--30% at% (Tolerance 10% of concentration)	Diameter	20 mm (+0.0/ -0.025mm)
Length	1~70mm, (+/-0.05mm)	Coating Specification	AR @ 940nm or HR @940nm AR @ 1053nm or AR @1030nm or HR @1053nm
Parallelism	< 10 arc seconds	Perpendicularity	< 5 arc minutes
Chamfer	0.15x45°	Barrel Finish	ground or polished
Wavefront Distortion	<λ/10 per inch at 632.8nm for <7mm	Surface Flatness	<λ/10 at 632.8nm
Surface Quality	better than 20/10	Clear Aperture	Central 95%

Physical and Optical Properties:

Chemical Formula	Yb:Y3Al5O12	Crystal Structure	Cubic
Lattice Constants	12.01 Å	Melting Point	1970℃
Density	4.56 g/cm3	Mohs Hardness	8.5
Thermal Expansion Coefficient	7.8x10-6/K, [111], 0-250℃	Thermal Conductivity	14 W.s /m /K @ 20℃
Loss Coefficient	0.003 cm-1	Index of Refraction	1.82
Lasing Wavelength	1030nm	Pump Wavelength	940nm
Absorption band about pump wavelength	10nm		

Ti:Sapphire Crystals



- Excellent thermal conductivity
- Larger gain bandwidth
- Large laser emission cross-section
- Excellent for tunable lasers and ultra-fast pulsed lasers

Titanium-doped Sapphire (Ti:Sapphire) is one of the most prevalent laser crystals for tunable and ultrashort pulsed lasers with high gain and high power outputs. Ti:Sapphire crystals of Shalom EO are grown by the method of Temperature Gradient Technique (TGT), large-size (Dia.30x 30mm) Ti:Sapphire crystal absent of light scatter, with the dislocation density less than 102cm-2 could be provided. The TGT-grown sapphire crystal is characterized by the (0001) oriented growth, high doping level (a490= 4.0cm-1), high gain, and exceptional laser damage threshold.

Application Notes:

The tunable wavelengths that cover a broad range from 700 to 1000nm make Ti:Sapphire an excellent substitute for dye lasers in many applications.
Frequency-doubled by NLO crystals such as ultra-thin BBO, Ti:Sapphire can be used to generate UV and DUV (up to 193nm) laser with ultrafast pulses with pulse durations less than 10fs.
Ti:Sapphire is also used as the pumping source of Optical Parametric Oscillation (OPO) to expand the tunable range.

Specifications:

Orientation	Optical axis C normal to rod axis	Ti2O3 Concentration	0.06 - 0.26atm %
Figure Of Merit(FOM)	100~200	α490	1.0-4.0cm-1
Diameter	2-30mm or specified	Path Length	2-30mm or specified
End Configurations	Flat/Flat or Brewster/Brewster ends	Flatness	<λ/10 @ 633nm
Parallelism	<10 arc sec	Surface Finishing	<20/10 scratch/dig per MIL-PRF-13830B
Wavefront Distortion	<λ/4 per inch		

Physical and Optical Properties:

Chemical Formula	Ti3+: Al2O3	Crystal Structure	Hexagonal
Lattice Constants	a=4.758, c=12.991	Density	3.98 g/cm3
Melting Point	2040℃	Mohs Hardness	9
Thermal Conductivity	52 W/m/k		

Alexandrite Laser Crytstals



- Eminent for long pulsed, Q-switched or pico second 755nm laser
- High damage threshold (capable of withstanding >1.5 million pulses)
- High thermal shock resistance and wide wavelength emission range
- Refurbishing service (re-polishing and re-coating) for used alexandrite rods
- DKDP 755nm Pockels Cells available

Alexandrite (chromium-doped beryllium aluminate, Cr3+:BeAl2O4) is a kind of crystalline laser gain medium grown in monocrystalline form using the improved Czochralski method, and the laser-active Cr3+ ions are doped in the host crystal. Alexandrite laser crystal is capable of generating a wide range of wavelengths, a tuning range of 710nm to 800nm is possible under optimum operating conditions. The most prevalent wavelength is around 755nm, where maximum efficiency could be attained. Alexandrite laser crystal is a topical material in the current market for applications in various industrial fields including Dermatology, Atmospheric Lidar, or Spectroscopy (which exploits the wavelength tunability of Alexandrite), etc. And is advantageous for Medical Laser Devices (e.g. Hair Removal Lasers). In addition, attributing to an anisotropic structure, combined with its significant birefringent property, it is possible to achieve light emission of linear polarization of low depolarization loss with an Alexandrite laser.

Hangzhou Shalom offers customized Alexandrite laser crystals favorable for 755nm long-pulsed, Q-switched, or picosecond lasers, with high damage threshold, high thermo-optical quality, and competitive price. We also provide refurbishing services (re-polishing and re-coating for used laser rods).

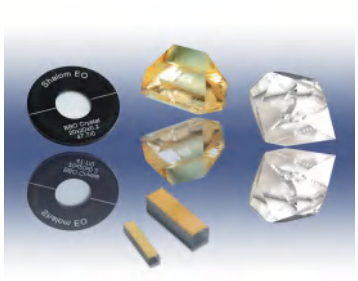
Specifications:

Size Tolerance	Diameter (+0/-0.05 mm) x Length (+1/-0 mm)		
Surface Quality	10/5 S/D	Parallelism	<10″
Allowed Chips	<0.1mm	Perpendicularity	<5'
Flatness	λ/10@633nm	Clear Aperture	≥98%
Coating Options	1- Normal : AR@755nm on both ends 2- Mirror coating: HR@755nm(S1) & PR@755nm(S2)		
Optional End Forms of Rod	1- Plano-Plano 2- Convex-Plano		
Damage Threshold	> 1.5 Million pulses (tested by third party)		

Material Properties:

Fomula	Cr3+:BeAl2O4
Lattice Constants (Angstrom)	5.476(a) x 9.404(b) x 4.427(c)
Molecular weight	127.01 g/mole
Hardness (Mohs)	8.5
Lasing wavelength	710 - 800 nm
Crystal System	Orthorhombic
Refractive Index (@750 nm)	1.7367(a) x 1.7241(b) x 1.7346(c)
Thermal Expansion Coefficient (x 10^-6/K)	5.9(a), 6.1(b), 6.7(c)
Vickers Hardness(kg/mm^2)	2000
Melting Point	1870 ℃
Thermal Conductivity	0.23 W/cm•K
Density	3.7 g/cm^3
Young's Modulus (GPa)	469
Thermal Shock Resistance (W/cm)	35 - 74
dn/dT	8x10^-6/K

Nonlinear Crystals



A Nonlinear Crystal or NLO Crystal is an optical crystal that exhibits a strong nonlinear dielectric response function to optical radiation. Nonlinear crystals are important components in the fields of photonics and lasers. One of the major applications of NLO crystals is Nonlinear Optical Conversion of Frequencies, where laser wavelengths that are inaccessible (e.g. 2-7 micro wavelengths) without deliberate interventions are generated by altering the frequencies (hence the wavelength) of the output light. And some of them could also be utilized as EO/AO Modulation crystals.

Nonlinear crystals stand as the cornerstone of cutting-edge photonics and laser technologies, driving innovations across various scientific and industrial domains. Their inherent ability to manipulate light waves enables a vast range of applications. Moreover, their adaptability to different phase-matching methodologies broadens the scope of their usages, enabling precise control over optical frequencies. From harmonic generation to parametric amplification, nonlinear crystals are critical in diverse processes like second, third fourth, and even fifth harmonic generation, as well as sum and difference frequency generation. In addition, the crystals are indispensable in enabling critical functionalities like electro-optic and acousto-optic modulation, essential for signal processing and communications, further underlining their indispensable role in modern optics.

Hangzhou Shalom EO offers various off-the-shelf and custom nonlinear crystals with versatile functions, including Beta Barium Borate (Beta BBO) Crystals, Ultra-thin Beta BBO for Femtoline Lasers, Potassium Dideuterium Phosphate (KDP/DKDP) Crystals, Lithium Triborate (LBO) Crystals, Potassium Titanyl Phosphate (KTP/HGTR KTP) Crystals, Potassium Titanyle Arsenate (KTA) Crystals, Bismuth Borate (BIBO) Crystals, Lithium Iodate (LiIO3) Crystals, LiNbO3 (Lithium Niobate)/MgO: LiNbO3 Crystals, RTP Crystals, and ZnGeP2 (ZGP) Crystals. Miscellaneous coating options including uncoated, AR, HR, HT, PR coatings, and custom coatings are available. All the crystals will undergo rigorous inspection before dispatch.

The nonlinear crystals we manufactured feature laser-grade polished with high geometric precision/flexible coating options, and a wide transmission range covering Ultra Violet to Infrared wavelength region, with the additional advantages of large nonlinearities, high damage thresholds, and large-dimension capabilities. Our crystals are compliant with various phase-matching techniques (e,g. critical/non-critical phase matching), and capable of coping with a broad assortment of frequency conversion purposes, encompassing: Second Harmonic Generation/Doubling Frequencies(SHG), Third Harmonic Generation (THG), Fourth Harmonic Generation (4HG), and Fifth Harmonic Generation (5HG), SFG/DFG, Optical Parametric Oscillation (OPO), and Optical Parametric Amplification (OPA) for laser output generation. In addition, the crystals are also prominent for EO and AO Modulations and spontaneous Parametric Down Conversion (SPDC).

BBO Crystals



- Versatile applications: SHG, THG,4HG,5HG, OPO, OPA, OPG, SFG/DFG, SPDC, EO Modulations
- Large-size BBO crystals available, with a maximum aperture of 20x20mm
- Broad phase-matching range from 409.6nm to 3500nm
- Exceptional SHG coefficient and high damage threshold
- Ultra-thin Crystals for Femto-line Lasers: minimum thicknesses: 0.01mm (with FS substrate), 0.05mm (Free-standing)
- Coating options: P-coating/ multi-layer V-coating/ single, dual wavelength AR coating

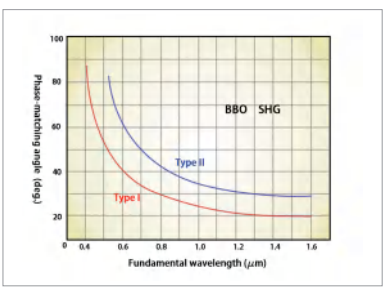
Beta Barium Borate (or Beta BBO) Crystal, with the chemical formula BaB2O4, is a kind of negative uniaxial crystal with a trigonal structure. BBO crystal is one of the most prevalent nonlinear optical crystals. BBO crystal manifests outstanding optical features including its high nonlinear optical coefficient, stability over temperature changes, broad optical transmission range of 189-3500 nm, and a high damage threshold. What's more important, the advent of BBO crystals fills the shortage of nonlinear crystals that generate ultraviolet wavelengths, offering coverage for UV output which is not possible to be obtained with fundamental wavelengths. The crystal has a Second Harmonic Generation (SHG) coefficient 3-6 times larger than currently procurable ADP and KDP crystals in the near-infrared, visible, and ultraviolet spectrum. Its damage threshold is 15Gw/cm^2, which is 200% higher than that of KDP, and much higher than that of LiNbO3. In addition, its optical homogeneity (δn ≈10-6/cm) is also impressive.

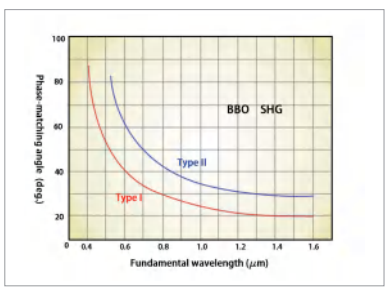
These characteristics made Beta BBO crystals versatile for various NLO applications such as Harmonic Generations (e.g. SHG, THG, Fourth Harmonic Generation, Fifth Harmonic Generation), Optical Parametric Oscillations(OPO), Optical Parametric Amplifiers(OPA), and other applications in the field of Quantum Optics(quantum entanglement) and EO applications.

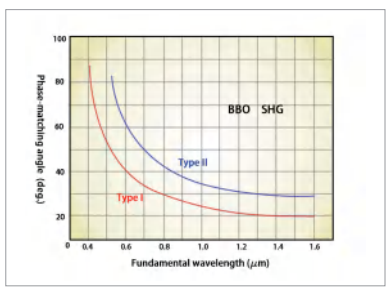
Hangzhou Shalom EO offers off-the-shelf and customized BBO Crystals for nonlinear optical applications. Besides the advantages of high frequency conversion efficiencies, wide transmission spectrum, broad phase matching range, our BBO crystals feature the availability of large-dimension single crystals and low thermal-optical coefficients which promote thermal stability. The crystals are grown leveraging state-of-the-art fabrication techniques, which endows the BBO crystals with high optical homogeneity. Coating options are miscellaneous, including P-coating/ multi-layer V-coating/ single, dual-wavelength AR coating. The ultra-thin 0.01mm thickness with fused silica substrates and 0.05mm thickness free-standing BBO crystals are available For Femto-line Lasers, ultra-thin crystals are available, and the minimum thicknesses are 0.01mm (mounted with Fused Silica Substrates) and 0.05mm (Free-standing). Shalom EO also provides BBO crystals for Electro-Optic (EO) modulations, with high-precision polishing and Cr-Au electrodes furnished.

Shalom EO's BBO Crystals feature:
Broad phase-matching range from 409.6nm to 3500nm
Large-Dimension-capability, maximum aperture 20x20mm
Wide transmission spectrum from 190nm to 3500nm
Large effective second-harmonic-generation (SHG) coefficient
High optical homogeneity
Wide temperature bandwidth
High damage threshold

Curves:







Specifications:

Dimension Tolerance	(W±0.1mm)x(H±0.1mm)	Clear Aperture	central 90% of the diameter
Scattering of Crystals	No visible scattering paths or centers under the inspection of 50mW green Laser	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/8 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤20 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	≤0.25°	Quality Warranty Period	one year under proper use
Mount	Diameter 1" or Custom		

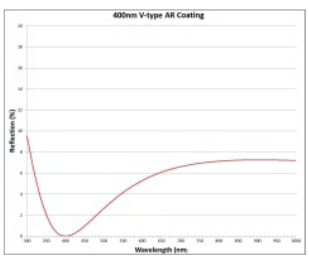
Chemical and Structural Properties:

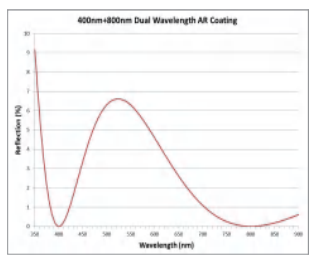
Crystal Structure	Trigonal, space group R3c	Lattics Parameters	a=b=12.532Å, c=12.717Å, Z=6
Melting Point	About 1095℃	Mohs Hardness	4
Density	3.85g/cm3	Thermal Conductivity	1.2W/m/K(⊥ c): 1.6W/m/K(//c)
Thermal Expansion Coefficients	a11=4x10-6/K; a33=36x10-6/K		

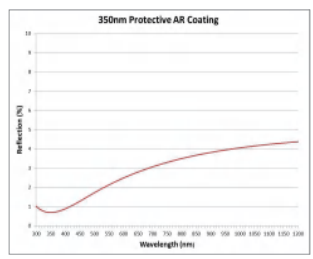
Optical and Nonlinear Optical Properties:

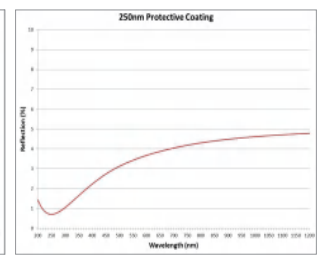
Transparency Range	190-3500nm	SHG Phase Matchable Range	409.6-3500nm(Type I) 525-3500nm(Type II)
Therm-optic Coefficients(/℃)	dno/dT=-16.6X10-6 dne/dT=-9.3X10-6	Absorption Coefficients	<0.1%/cm at 1064nm <1%/cm at 532nm
Angle Acceptance	0.8mrad-cm (θ, Type I,1064 SHG) 1.27mrad-cm (θ, Type II,1064 SHG)	Temperature Acceptance	55℃ -cm
Spectral Acceptance	1.1nm-cm	Walk-off Angle	2.7° (Type I 1064 SHG) 3.2° (Type II 1064 SHG)
NLO Coefficients	deff(I)=d31sinθ+(d11cosΦ-d22sin3Φ)cosθ deff(II)=(d11sin3Φ+d22cos3Φ)cos2θ	Non-vanished NLO Susceptibilities	d11=5.8xd36(KDP) d31=0.05xd11 d22<0.05xd11
Sellmeier Equations(λ in μm)	no2=2.7359+0.01878 / (λ2-0.01822) -0.01354 λ2 ne2=2.3753+0.01224 / (λ2-0.01667) -0.01516 λ2	Electro-optic Coefficients	r22=2.7pm/V
Half-wave Voltage	7KV (at 1064nm,3*3*20mm3)	Resistivity	>1011upohm-cm
Relative Dielectric Constant	εs11/εo:6.7 εs33/εo:8.1 Tan δ<0.001		

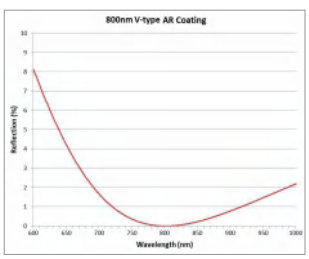
AR coating Curves of BBO Crystals

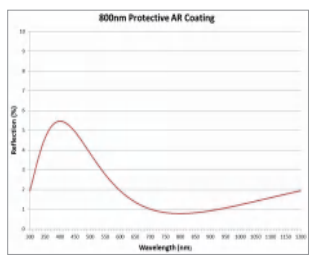


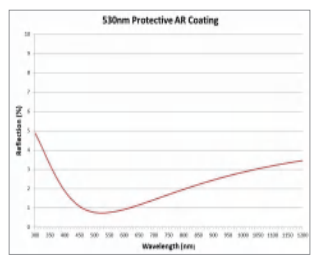


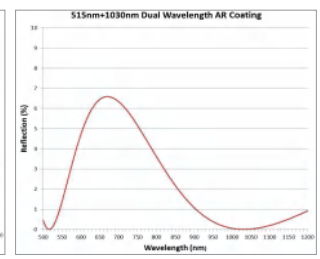












Product List of BBO Crystals

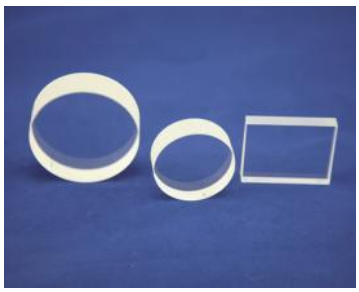
Code	Size	Thickness	Substrate	θ	φ	Coating	Application	Unit Price
20201-001	6x6mm	0.01mm	Yes	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-002	6x6mm	0.02mm	Yes	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-003	6x6mm	0.05mm	No	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-004	6x6mm	0.1mm	No	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-005	6x6mm	0.5mm	No	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-006	6x6mm	1.0mm	No	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-007	6x6mm	1.5mm	No	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-008	6x6mm	2.0mm	No	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-009	6x6mm	0.01mm	Yes	29.2°	90°	P/P	SHG@800nm Type1	$380
20201-010	6x6mm	0.02mm	Yes	29.2°	90°	P/P	SHG@800nm Type1	$380
20201-011	6x6mm	0.05mm	No	29.2°	90°	P/P	SHG@800nm Type1	$380
20201-012	6x6mm	0.1mm	No	29.2°	90°	P/P	SHG@800nm Type1	$305
20201-013	6x6mm	0.2mm	No	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-014	6x6mm	0.5mm	No	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-015	6x6mm	1.0mm	No	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-016	6x6mm	2.0mm	No	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-017	10x10mm	0.02mm	Yes	29.2°	90°	P/P	SHG@800nm Type1	$605
20201-018	10x10mm	0.05mm	No	29.2°	90°	P/P	SHG@800nm Type1	$605
20201-019	10x10mm	0.1mm	No	29.2°	90°	P/P	SHG@800nm Type1	$530
20201-020	10x10mm	0.2mm	No	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-021	10x10mm	0.5mm	No	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-022	10x10mm	1.0mm	No	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-023	10x10mm	1.5mm	No	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-024	10x10mm	2.0mm	No	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-025	6x6mm	0.01mm	Yes	44.3°	90°	P/P	THG@800nm Type1	$380
20201-026	6x6mm	0.02mm	Yes	44.3°	90°	P/P	THG@800nm Type1	$380
20201-027	6x6mm	0.05mm	No	44.3°	90°	P/P	THG@800nm Type1	$380
20201-028	6x6mm	0.1mm	No	44.3°	90°	P/P	THG@800nm Type1	$305
20201-029	6x6mm	0.2mm	No	44.3°	90°	P/P	THG@800nm Type1	$245
20201-030	6x6mm	0.5mm	No	44.3°	90°	P/P	THG@800nm Type1	$245
20201-031	6x6mm	1.0mm	No	44.3°	90°	P/P	THG@800nm Type1	$245
20201-032	6x6mm	2.0mm	No	44.3°	90°	P/P	THG@800nm Type1	$245
20201-033	10x10mm	0.02mm	Yes	44.3°	90°	P/P	THG@800nm Type1	$605
20201-034	10x10mm	0.05mm	No	44.3°	90°	P/P	THG@800nm Type1	$605
20201-035	10x10mm	0.1mm	No	44.3°	90°	P/P	THG@800nm Type1	$530
20201-036	10x10mm	0.2mm	No	44.3°	90°	P/P	THG@800nm Type1	$455
20201-037	10x10mm	0.5mm	No	44.3°	90°	P/P	THG@800nm Type1	$455
20201-038	10x10mm	1.0mm	No	44.3°	90°	P/P	THG@800nm Type1	$455
20201-039	10x10mm	2.0mm	No	44.3°	90°	P/P	THG@800nm Type1	$575
20201-040	10x10mm	2.5mm	No	44.3°	90°	P/P	THG@800nm Type1	$575
20201-041	10x10mm	5.0mm	No	44.3°	90°	P/P	THG@800nm Type1	$760
20201-042	7x7mm	6.0mm	No	47.6°	90°	P/P	4HG@1064nm Type1	$560
20201-043	6x6mm	2.0mm	No	21.2°	90°	P/P	Type1 Phase Matching	$245
20201-044	5x5mm	0.5mm	No	23.4°	90°	P/P	Type1 Phase Matching	$245.0
20201-045	8x8mm	2.5mm	No	23.4°	90°	P/P	Type1 Phase Matching	$395
20201-046	10x10mm	0.1mm	No	28.5°	90°	P/P	Type1 Phase Matching	$530

Product List of BBO Crystals

Code	Size	Thickness	Substrate	θ	φ	Coating	Application	Unit Price
20201-047	8x8mm	0.5mm	No	29°	90°	P/P	Type1 Phase Matching	$350
20201-048	8x8mm	2.5mm	No	29°	90°	P/P	Type1 Phase Matching	$395
20201-049	6x6mm	1.0mm	No	29.2°	90°	P/P	Type1 Phase Matching	$245
20201-050	8x8mm	1.0mm	No	29.2°	90°	P/P	Type1 Phase Matching	$350
20201-051	6x6mm	2.0mm	No	30°	90°	P/P	Type1 Phase Matching	$245
20201-052	6x6mm	0.2mm	No	30.5°	90°	P/P	Type1 Phase Matching	$245
20201-053	6x6mm	1.0mm	No	30.5°	90°	P/P	Type1 Phase Matching	$245
20201-054	6x6mm	2.0mm	No	30.5°	90°	P/P	Type1 Phase Matching	$245
20201-055	3x3mm	4.0mm	No	31.3°	90°	P/P	Type1 Phase Matching	$245
20201-056	3x3mm	6.0mm	No	31.3°	90°	P/P	Type1 Phase Matching	$245
20201-057	6x6mm	2.0mm	No	31.5°	90°	P/P	Type1 Phase Matching	$245
20201-058	6x6mm	2.5mm	No	31.5°	90°	P/P	Type1 Phase Matching	$245
20201-059	8x8mm	0.6mm	No	32°	90°	P/P	Type1 Phase Matching	$350
20201-060	8x8mm	1.0mm	No	32°	90°	P/P	Type1 Phase Matching	$350
20201-061	6x6mm	0.6mm	No	32.5°	90°	P/P	Type1 Phase Matching	$245
20201-062	6x6mm	1.0mm	No	32.5°	90°	P/P	Type1 Phase Matching	$245
20201-063	8x8mm	0.8mm	No	32.5°	90°	P/P	Type1 Phase Matching	$350
20201-064	5x5mm	2.5mm	No	32.6°	90°	P/P	Type1 Phase Matching	$245
20201-065	5x5mm	4.0mm	No	32.6°	90°	P/P	Type1 Phase Matching	$275
20201-066	8x8mm	1.0mm	No	35°	90°	P/P	Type1 Phase Matching	$350
20201-067	8x8mm	2.0mm	No	35°	90°	P/P	Type1 Phase Matching	$350
20201-068	20x20mm	0.15mm	No	35°	90°	P/P	Type1 Phase Matching	$1970
20201-069	20x20mm	0.2mm	No	35°	90°	P/P	Type1 Phase Matching	$1970
20201-070	10x10mm	3.0mm	No	40.3°	90°	P/P	Type1 Phase Matching	$575
20201-071	8x8mm	0.3mm	No	42.8°	90°	P/P	Type1 Phase Matching	$350
20201-072	6x6mm	0.2mm	No	43°	90°	P/P	Type1 Phase Matching	$245
20201-073	8x8mm	0.1mm	No	43°	90°	P/P	Type1 Phase Matching	$395.0
20201-074	8x8mm	0.5mm	No	43°	90°	P/P	Type1 Phase Matching	$350
20201-075	5x5mm	1.0mm	No	44°	90°	P/P	Type1 Phase Matching	$245
20201-076	8x8mm	0.15mm	No	44.3°	90°	P/P	Type1 Phase Matching	$350
20201-077	8x8mm	0.5mm	No	44.3°	90°	P/P	Type1 Phase Matching	$350
20201-078	10x10mm	0.4mm	No	45.9°	90°	P/P	Type1 Phase Matching	$455
20201-079	3x3mm	4.0mm	No	47.7°	90°	P/P	Type1 Phase Matching	$245
20201-080	8x8mm	1.0mm	No	47.7°	90°	P/P	Type1 Phase Matching	$350
20201-081	8x8mm	3.0mm	No	47.7°	90°	P/P	Type1 Phase Matching	$440
20201-082	10x10mm	1.0mm	No	47.7°	90°	P/P	Type1 Phase Matching	$455
20201-083	10x10mm	2.5mm	No	47.7°	90°	P/P	Type1 Phase Matching	$575
20201-084	8x8mm	0.1mm	No	48°	90°	P/P	Type1 Phase Matching	$395
20201-085	8x8mm	0.2mm	No	48°	90°	P/P	Type1 Phase Matching	$350
20201-086	4x4mm	2.8mm	No	51.2°	90°	P/P	Type1 Phase Matching	$245
20201-087	5x5mm	2.5mm	No	28°	30°	P/P	Type2 Phase Matching	$245
20201-088	8x8mm	2.5mm	No	28°	30°	P/P	Type2 Phase Matching	$395
20201-089	5x5mm	2.0mm	No	28.7°	30°	P/P	Type2 Phase Matching	$245
20201-090	8x8mm	0.6mm	No	30°	30°	P/P	Type2 Phase Matching	$350
20201-091	10x10mm	1.0mm	No	32°	30°	P/P	Type2 Phase Matching	$575
20201-092	10x10mm	5.0mm	No	32°	30°	P/P	Type2 Phase Matching	$760

DKDP (KD*P) Crystals





- High damage threshold
- For a variety of applications: SHG, THG, 4HG and EO Pockels Cells
- Maximum dimension: 100x100x60mm
- Transmission wavelength range: 200-2150nm
- DKDP blanks, laser-grade polished crystals available
- Strict QC inspection ensuring high-quality products

Potassium Dideuterium Phosphate (DKDP or KD*P) Crystals are one the most common industrial-grade NLO materials. Compared with traditional KDP crystals, the additional deuterium composition helps to expand the transmission wavelength range,and eliminate the detrimental parasitic oscillation resulting from Ramen Scattering, an issue that could be problematic in particular for high-power lasers. KD*P crystals are superior for Second Harmonic Generation (SHG), Third Harmonic Generation (THG), and Fourth Harmonic Generation (FHG) of Nd:YAG lasers at room temperature. In addition, Potassium Dideuterium Phosphate crystals also inherit high electro-optic coefficients, making them excellent for being used as Electro-Optical Modulators, such as EO Q-switches, EO Pockels Cells, etc.

Other distinctive merits of DKDP crystals are being available in large dimensions and low fabrication cost, making DKDP the most prevalent crystals at the current stage for manufacturing large aperture nonlinear optical components. Other characteristics of DKDP include their good UV transmission, high birefringence, and low nonlinearities relative to other NLO materials.

Hangzhou Shalom EO offers DKDP crystals for NLO applications and EO modulations with various cutting angles and a maximum dimension of 100x100x60mm. The crystals are high-quality guaranteed, exhibiting no visible scattering path or center under the observation of a 50mW green laser. A high deuterium composition ratio (>98%) could be obtained. Further strict QC inspections are done in Shalom EO's cleanroom before despatch. Both crystal blanks and laser-grade-polished (20/10 Scratch/Dig) DKDP crystals are available. Refer to DKDP Crystals for EO modulations, boules, blanks, and AR-coated crystals with Cr-Au electrodes are all accessible upon your request.

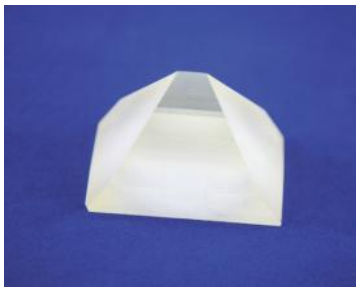
Specifications:

Dimension Tolerance	(W±0.1mm) ×(H±0.1mm)× (L+0.2mm/-0.1mm) or (Dia ± 0.1mm)×(L+0.2/-0.1mm)	Wavefront Distortion	< λ/8 @ 633nm
Clear Aperture	> 90% of central area	Chamfer	≤0.3mm @45°
Flatness	λ/8 @ 633nm (L≥ 2.5mm) λ/4 @ 633nm (L< 2.5mm)	Chips	≤ 0.1mm
Surface Quality	20/10 S/D	Parallelism	< 10"
Perpendicularity	≤ 10'	Angle Tolerance	≤ 0.2°
Interior Quality	No visible scattering path or center under the inspection 50mW green laser		

Basic Material Properties:

Chemical Formula	KD2PO4	Curie Temperature	222K
Symmetry	42m	Density	2.355g/cm3
Absorption	0.005/cm	Extinction Ratio	1:10000
Deuterium Ratio	>98%	Transmission Band	200-1600nm
Non-linear Coefficient	d36=0.40pm/v	Longitudinal Half-wave Voltage	2.98KV(l=546nm)
Electric Resistance	>2x109Ω/cm	Electric –optical Coefficient	r41=8.8pm/v, r63=25pm/v

KTP Crystals



- Stock and custom crystals are available
- Maximum aperture: 40x40mm
- High nonlinear coefficient, high damage threshold
- Wide acceptance angle and mild angular walk-off
- Applications: SHG@1064nm, OPO, OPA, OPG, and Waveguides
- High Gray Track Resistance (HGTR) KTP crystals are also available

Potassium Titanyl Phosphate (KTiOPO3 or KTP) Crystals are a versatile kind of optical crystals. The advantages of KTP crystals include high non-linear coefficient and damage threshold, wide acceptance angle, substantial temperature-stable phase-matching characteristics, and non-hygroscopicity. These traits, combined with its excellent transmission in the visible and near-IR wavelength range, have built up their prevalence in the field of Nonlinear Optics (NLOs). KTP crystals could be utilized in the Second Harmonic Generation (SHG) of Nd:YAG lasers. When Shalom's KTP is applied outside the cavity of a 900mJ injection-seeded Q-switch Nd: YAG laser, the resultant output is a 700mJ green laser, suggesting a high conversion efficiency of over 80%. Other applications include OPO/OPA/OPG to obtain 600nm-4500nm light output and SFM.

On the other hand, KTP crystals also manifest promising Electro-Optical properties, including great electro-optical coefficients and low dielectric constants, etc. Because KTP crystals virtually produce no parasitic oscillation, the crystals are attractive options for manufacturing EO modulators, Q-switches, EO deflectors, waveguides, etc.

Hangzhou Shalom EO offers off-the-shelf and custom KTP Crystals with various coating options and rigorous QC inspection, and manifold apertures values up to 40x40mm are available. Standard coating options include: AR, HR, HT, and PR dual-wavelength coatings for SHG, other custom coatings could also be tailored. For applications with higher power levels, High Gray Track Resistance (HGTR) KTP crystals are also procurable in Shalom EO.

Specifications:

Internal Quality	No visible scattering paths or centers	Flatness	less than λ/10 @ 633nm
Transmitting Wavefront Distortion	under the inspection of a 50mW green laser	Chamfer	≤0.2mm at 45°
Chip	less than λ/8 @ 633nm	Surface Quality	better than 10/ 5 S/D (MIL-PRF-13830B)
Parallelism	≤0.1mm	Perpendicularity	≤5 arc minutes
Angle Tolerance	better than 20 arc seconds	Quality Warranty Period	one half year under proper use

Basic Properties:

Crystal Structure	Orthorhombic, space group Pna21, point group mm2	Lattice Parameter	a=6.404Å, b=10.616Å, c=12.814Å, Z=8
Melting Point	About 1172°C	Mohs Hardness	5
Density	3.01 g/cm3	Thermal Conductivity	13W/m/K
Thermal Expansion Coefficient	αx=11x10-6/°C, αy=9x10-6/°C, αz=0.6x10-6/°C		

Product List of KTP Crystals

Code	Size	θ	φ	Coating	Application	Unit Price
20203-020	2x2x5mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm	$29
20203-001	3x3x10mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$70
20203-002	4x4x10mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$115
20203-003	4x4x15mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$140
20203-014	4x4x16mm	90°	0°	S1:HR/HT, S2:HR/PR@1570nm+1064nm	OPO of 1064nm to 1570nm	Inquire
20203-015	4x4x20mm	90°	0°	AR/AR@1570nm+1064nm	OPO of 1064nm to 1570nm	Inquire
20203-004	5x5x5mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$75
20203-016	5x5x20mm	90°	0°	S1:HR/HT, S2:HR/PR@1570nm+1064nm	OPO of 1064nm to 1570nm	Inquire
20203-005	6x6x3mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$35
20203-021	6x6x5mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm	$85
20203-017	6x6x20nm	90°	0°	AR/AR@1570nm+1064nm	OPO of 1064nm to 1570nm	Inquire
20203-006	6x6x25mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$370
20203-018	7x7x20mm	90°	0°	AR/AR@1570nm+1064nm	OPO of 1064nm to 1570nm	Inquire
20203-007	7x7x5mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$140
20203-008	8x8x5mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$185
20203-019	8x8x20mm	90°	0°	AR/AR@1570nm+1064nm	OPO of 1064nm to 1570nm	Inquire
20203-012	9x9x5nm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	Inquire
20203-009	9x9x6mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$245
20203-010	10x10x3mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$215
20203-011	10x10x5mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	$275
20203-022	13x13x3mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm	$230
20203-013	15X15X6mm	90°	23.5°	AR/AR@1064nm+532nm	SHG of 1064nm, Type2	Inquire

HGTR KTP Crystals



- High gray track resistance
- High damage threshold: >2GW/cm^2 (@1064nm; TEM00, 10nS,10Hz)
- High conversion efficiency up to 80%
- Common Applications: Continuous Wave (CW) and high average power SHG for green laser, EO modulations, optical waveguide

Gray track resistance in HGTR KTP (KTiOPO4) Crystals is significantly higher than in flux-produced KTP. In comparison to ordinary KTP crystals which are flux or hydrothermally grown, HGTR KTP crystals are grown from unique modified fluxes and heat treatment, imparting them with immunity to gray track damage, which could be seriously interrupting for high-power applications.

Hangzhou Shalom EO offers the High Gray Track Resistance KTP crystals (HGTR KTP), with no detrimental absorption for high repetition/high power SHG at 1064nm or OPO of 532nm pumped light source. The crystals are optimized for high-power laser systems which require substantially efficient conversion and durability, providing elevated overall performance than regular flux-grown KTP crystals.

Applications:

Second harmonic generation for frequency doubling
Optical parametric oscillator (OPO)
Electro-optic pockels cells
Quasi-phase matching

Specifications:

Materials	HGTR-KTP crystals	Dimension Tolerance	(W±0.1mm)x(H±0.1mm)x(L+0.5/-0.1mm)
Size Range	Aperture:~10x10mm; Length: ~15mm	Clear Aperture	central 90% or the diameter
Scattering of Crystals	No visible scattering paths or centers	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/8 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤20 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	≤0.25°	Coating	AR/AR@1064nm+532nm (R<0.2%@1064nm and R<0.5%@532nm)
Quality Warranty Period	one year under proper use		

LBO Crystals



- Broad transmission range from 160nm to 2600nm (SHG range from 550nm to 2600nm).
- Type I and Type II non-critical phase-matching (NCPM) over a wide wavelength range.
- Large effective SHG coefficients (about three times larger than that of KDP).
- High damage threshold (18.9 GW/cm2 for a 1.3ns laser at 1054nm).
- Wide acceptance angle and a small walk-off.
- High optical quality (homogeneity dn≈ 10-6/cm) and free of inclusion.

Lithium Triborate (LBO, or LiB3O5) Crystal is one of the most useful nonlinear optical materials, not just because of its large conversion coefficients (which are 3 times larger than that of KDP), but also its high damage threshold (which is the highest among the inorganic nonlinear crystals), wide angular bandwidth and small walk-off angle. LBO crystal has a broad optical transmission range from 160 to 2600nm, making them appropriate for high-power military/medical Nd:YAG/Nd:YLF lasers, Ti: Saphhire and Cr:LiSAF lasers, etc. It excels in high-power SHG with minimal thermal lensing effect compared to KTP. In addition, LBO crystal also boasts a broad wavelength range where non-critical phase matching (NCPM) can be achieved at room temperature.

Hangzhou Shalom offers both stocked and custom lithium Triborate (LBO crystals) for THG and SHG of Nd-doped laser, Type I and Type II non-critical phasematching, and 0PO/0PA. The crystal features great optical homogeneity and few stress stria. The damage thresholds of our LBO crystal are impressive, which has a high altitude of >10GW/cm^2 for 1064nm, TEM00, 10ns, and 10HZ (with no coating), The surface quality could be elevated to 10/5 Scratch/Dig. Quasi-phase matching

Specifications:

Material	LBO crystals	Clear Aperture	central 80% of the diameter
Dimension	Maximum Dimension 70x70x20mm	Transmitting Wavefront Distortion	better than λ/8 @ 633nm
Flatness	λ/8 @ 633nm	Surface Quality	Surface Quality: 10/5 S/D (MIL-O-13830A)
Parallelism	better than 20 arc seconds	Perpendicularity	15 arc minutes
Damage Threshold (GW/cm^2)	>10 for 1064nm, TEM00, 10ns, 10HZ (with no coating) >1 for 1064nm, TEM00, 10ns, 10HZ (AR-coated) >0.5 for 532nm, TEM00, 10ns, 10HZ (AR-coated)	Quality Warranty Period	one year

Product List of LBO Crystals

Code	Size	Length	θ	φ	Coating	Application	Unit Price
20205-001	2x2mm	10mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$75
20205-002	3x3mm	10mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$150
20205-003	3x3mm	15mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$200

Product List of LBO Crystals

Code	Size	Length	θ	φ	Coating	Application	Unit Price
20205-004	4x4mm	10mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$305
20205-005	4x4mm	15mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$380
20205-006	4x4mm	20mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$455
20205-007	5x5mm	10mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$380
20205-008	5x5mm	15mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$470
20205-009	5x5mm	20mm	90°	11.4°	AR/AR@1064+532nm	SHG@1064nm, Type1	$575
20205-010	3x3mm	10mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$150
20205-011	3x3mm	15mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$215
20205-012	4x4mm	10mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$305
20205-013	4x4mm	15mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$380
20205-014	4x4mm	20mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$455
20205-015	5x5mm	10mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$365
20205-016	5x5mm	15mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$485
20205-017	5x5mm	20mm	90°	0°	AR/AR@1064+532nm	NCPM SHG@1064 T=149□	$605

BIBO Crystals



- Broad transparent range from 286nm to 2500nm
- Large effective SHG coefficient (~ 9 times that of KDP)
- High damage threshold
- Maximum aperture: 15x15mm

BIBO(BiB3O6) Crystal is a newly developed Nonlinear Optical Crystal. It features a large effective nonlinear coefficient, a high damage threshold, and inertness to moisture. Its nonlinear coefficient is 3.5-4 times higher than that of LBO, and 1.5-2 times higher than that of BBO. It is a promising SHG crystal to generate blue laser output. The top-seeded solution growth (TSSG) technique is used for the growth of BIBO single crystals in Shalom EO.

Hangzhou Shalom EO offers BIBO(BiB3O6) Crystal with a maximum dimension of 15x15x15mm with AR coatings and mounts. Re-polishing services could also be arranged.

Applications of BIBO Crystals:

1. SHG and THG for medium and high power Nd: lasers at 1064nm
2. SHG and THG of high power Nd: lasers at 1342nm & 1319nm
3. SHG for the Nd: Lasers at 914nm & 946nm
4. Optical Parametric Amplifiers (OPA) and Oscillators (OPO) application

Specifications:

Clear Aperture	central 90% of the diameter	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/8 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	10/ 5 S/D (MIL-PRF-13830B)
Parallelism	better than 20 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	Δθ≤0.25°, ΔΦ≤0.25°	Quality Warranty Period	one year under proper use

Chemical and Structure Properties:

Crystal Structure	Monoclinic, Point group 2	Lattice Parameter	a=7.116Å,b=4.993Å, c=6.508Å, β=105.62° ,Z=2
Melting Point	726°C	Mohs Hardness	5-5.5
Density	5.033 g/cm3	Thermal Expansion Coefficient	αa=4.8x10-5 /K, αb=4.4x10-6 /K, αc=-2.69x10-5 /K

Chemical and Structure Properties:

Transparency Range	286-2500nm	Absorption Coefficient	<0.1%/cm at 1064nm
Physical Axis	X//b,(Z,a)=31.6°,(Y,c)=47.2°	SHG of 1064/532	Phase matching angle:168.9° from z axis in YZ plane Deff:3.0+/-0.1 pm/V Angular acceptance:2.32 arad-cm Walk-off angle :25.6 mrad temperature acceptance:2.17°C-cm

Sellmeier Coefficients	ni2(λ)=A+B / (λ2-C)-Dλ2 (λ in um)			
	A	B	C	D
n1	3.6545(4)	0.0511(2)	0.0371(3)	0.0226(1)
n2	3.0740(3)	0.0323(1)	0.0316(3)	0.01337(6)
n3	3.1685(3)	0.0373(1)	0.0346(3)	0.01750(8)

ZGP (ZnGeP2) Crystals



- Wide transmission region from 0.74μm to 12μm
- Large nonlinear coefficient
- Broad phase-matching bandwidth
- AR/BBAR coatings
- Applications: SHG, SFG, OPO and OPG/OPA in the mid-infrared region

Zinc germanium phosphide (ZnGeP2) is a promising mid-IR nonlinear crystal, exhibiting outstanding NLO properties. ZnGeP2 (ZGP) crystals have large nonlinear susceptibility (d36~75 pm/V), which is approximately 160 times that of KDP. ZGP crystals are also optically transparent over the 0.74–12μm wavelength region, with a relatively high laser damage threshold, and are therefore recommendable for producing tunable laser output in the near-infrared spectrum. ZGP Crystals could accommodate various applications including SHG, SFG, OPO, and OPG/OPA.

Applications of ZGP Crystals:

1. Second, third, and fourth harmonic generation of CO2 laser
2. Optical parametric generation (OPO) with pumping at wavelengths of 2.05-2.94μm and possibly the effective generation of 3-10μm light output
3. Producing coherent radiation in sub-millimeter-range from 70.0μm to 1000μm - terahertz range
4. Generation of combined frequencies of CO2 and CO lasers radiation and other lasers working in the crystal transmission range

Specifications:

Material	ZnGeP2	Thickness Tolerance	+/-0.05mm
Orientation Tolerance	<0.5°	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/4 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤30 arc seconds	Perpendicularity	≤15 arc minutes
Aperture	>90%		

Chemical and Physical Properties:

Chemical Formula	ZnGeP2	Crystal Structure	Tetragonal, 42m
Lattice Parameter	a=b=5.467Å, c=12.736Å	Mass Density	4.16 g/cm3
Moh Hardness	5.5	Melting Point	About 1040°C
Thermal Conductivity	180 W/m/K	Thermal Expansion Coefficient	β,5x10-6 /K; β ⊥ ,7.8x10-6 /K
Birefringence	Positive uniaxial		

Linear Optical Properties

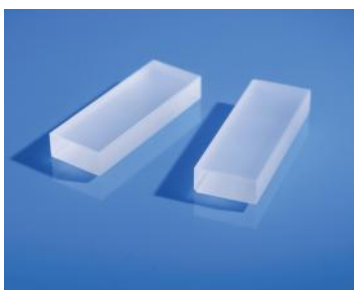
Transparency range	0.74 - 12μm
Absorption coefficient	α<0.05cm-1 @2050-2100nm

Refractive Indices @ 2.05 μm @ 2.79 μm @ 5.30 μm @ 10.6 μm	no = 3.1478, ne = 3.1891 no = 3.1333, ne = 3.1744 no = 3.1136, ne = 3.1547 no = 3.0729, ne = 3.1143
Sellmeier Equations(λ in μm)	no2(λ) = 4.64467+5.10087/(λ2-0.13656)+4.27777λ2/(λ2-1653.89) ne2(λ) = 4.71539+5.26358/(λ2-0.14386)+2.37310λ2/(λ2-1000.82)

Nonlinear Optical Properties

SHG Phase Matchable	3177 ~ 10357nm (Type I)
NLO coefficients	d36=75 ± 8 pm/V Type Ⅰ deeo=d36 sin2Θcos2φ Type Ⅱ doeo=deoo=d36 sinΘsin2φ
Damage Threshold	
at 2.79 μm	30 GW/cm2 (150 ps)
at 10.6 μm	1 GW/cm2 (2 ns)

YCOB Crystals



- Larger effective NLO susceptibilities than LBO
- High temperature endurance and laser-induced damaging threshold
- Non-deliquescence
- Czochralski-grown, low-cost, and short-growth period
- Maximum diameter 100mm
- Large aperture ideal for SHG, THG, OPO/OPA, and OPCPA of high-power lasers.

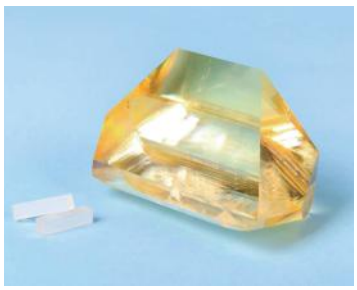
Yttrium Calcium Oxoborate (YCa4O(BO3)3,YCOB) Crystal is an excellent media for nonlinear optical and high-temperature piezoelectric usages. As a novel NLO crystal material, YCOB exhibits great thermal, mechanical, and nonlinear optical properties. It is regarded as an important candidate for frequency shifting of high-average power lasers. Its nonlinear optical coefficient is equivalent to that of BBO crystal and LBO crystal. Its strengths include a sizable aperture, high damage threshold in the femtosecond regime (around 2000-2500 GW/cm2), a wide acceptance angle small dispersion angle. Besides these attributes, YCOB boasts stable thermal and chemical properties with thermal expansion much less significant than that of LBO, non-deliquescent characteristics, and excellent machining properties. The crystals are accessible in large dimensions and hence could be utilized to manufacture large aperture laser components and achieve various parametric nonlinear processing (e.g. Second Harmonic Generation, Third Harmonic Generation, OPO/OPA, Optical Parametric Chirped-Pulse Amplification (OPCPA)) for high power lasers. YCOB crystals are deemed to hold promising prospects for applications in blue-green light and UV band optical frequency multiplication.

Hangzhou Shalom EO offers YCOB Crystals with a maximum diameter of 100mm. The YCOB crystals are Czochralski-grown, contributing to a faster growth rate and lower costs. Custom specifications of the YCOB crystals are available upon request.

Specifications:

Thickness Tolerance	+/-0.05mm	Orientation Tolerance	<0.5 degree
Flatness	less than λ/8 @ 633nm	Transmitting Wavefront Distortion	less than λ/4 @ 633nm
Chamfer	≤0.2mmx45°	Chip	/
Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)	Parallelism	≤30 arc seconds
Perpendicularity	≤5 arc minutes	Clear Aperture	>90%

KTA Crystals



- Large nonlinear and E-O coefficients
- Lower absorption in the 3-4μm range than KTP
- High damage threshold
- Maximum dimension: 15x15x30mm
- AR coatings at visible to 3300nm

Potassium Titanyle Arsenate(KTiOAsO4), or KTA Crystal, is an advantageous nonlinear optical crystal for Optical Parametric Oscillation (OPO) application. It has impressive non-linear optical and electro-optical coefficients, minute absorption in the 2.0-5.0 μm region, broad angular and temperature bandwidth, and low dielectric constants. It is also worth mentioning, that compared with KTP, the damage threshold of KTA crystals is higher attributed to their low ionic conductivities, and the absorption in the 3-4μm wavelength range is lower than the former.

Hangzhou Shalom EO is capable of growing KTA crystals of crystal length from 0.1-30mm, and dimensions up to 15x15x30mm, with the superior surface quality of 10/5 Scratch/Dig, and AR coatings at visible to 3300nm.

Common Applications of KTA Crystals:

1. Excellent for Optical Parametric Oscillation (OPO) for MWIR output up to 4 micros.
2. Second Harmonic Generation – SHG@1.083μm-3.789μm
3. Sum and Difference Frequency Generation (SFG and DFG)
4. Electro-optical Q-switch and modulation

Specifications:

Dimension	Maximum dimension 15x15x30mm	Dimensional Tolerance	(W+/-0.1mm)x(H+/-0.1mm)x(L+0.2/-0.1mm)
Wavefront Distortion	<Lambda/8@633nm	Chamfer	<0.15mm x 45°
Perpendicularity	< 5 arc min	Parallelism	<15 arc sec
Flatness	<Lambda/10 @ 633nm	Surface Quality	10/5 S/D
AR Coating	From visible to 3.3μm		

Basic Properties:

Crystal Structure	Orthorhombic, point group mm2	Lattice Parameter	a=13.125Å, b=6.5716Å, c=10.786Å
Melting Point	1130℃	Mohs Hardness	Near 5
Density	3.454g/cm3	Thermal Conductivity	K1:1.8W/m/K; K2: 1.9W/m/K;K3: 2.1W/m/K

Basic Properties:

Transparency Range		350-5300nm			
Absorption Coefficients		@ 1064nm <0.05 %/cm @ 1533nm <0.05 %/cm @ 3475nm <5%/cm			
NLO susceptibilities(pm/V)		d31 = 2.76, d32 = 4.74, d33 = 18.5 , d15 = 2.3, d15 = 3.2			
	Index	A	B	C	D
Sellmeier Equation Ni2=Ai+Biλ2/(λ2-Ci2)-Diλ2(λ in μm)	Nx	1.90713	1.23522	0.19692	0.01025
	Ny	2.15912	1.00099	0.21844	0.01096
	Nz	2.14768	1.29559	0.22719	0.01436
Electro-optical constants(pm/V) (low frequency)	γ33=37.5;γ23=15.4;γ13=11.5				
SHG Phase Matchable Range	1083-3789nm				

LiIO3 Crystals



- Broad transparent range from 0.5μm to 5.0μm
- For SHG, THG, and OPO of Nd:YAG, Ti:Sapphire, and Alexandrite Lasers
- Other Applications: EO modulation, piezoelectric transducers, etc.
- Optical-grade-polished
- Coating options: AR, BBAR or P-coating

Lithium Iodate (LiIO3) Crystal is a uniaxial nonlinear crystal with high nonlinear coefficients and a wide optical transparent range of 0.5μm to 5.0μm. It finds extensive utility in the SHG of the low and medium-power Ti:Sapphire, Alexandrite, Cr:LiSrAlF6, and Cr:LiCaAlF6 lasers. It is also preferable for the SHG and THG of Nd:YAG lasers and auto-correlators for measuring ultra-short pulse width. In some cases, it is used for optical parametric oscillation to obtain continuous tunable lasers at the wavelength range from 0.9μm to 1.2μm. Besides the nonlinear properties, the crystal also has versatile functions, supporting applications like EO modulations, piezoelectric transducing, etc. however, the limited damage thresholds of LiIO3 crystals restrain their usage for high-power lasers. For users, it is worth noting that LiIO3 crystals are very hygroscopic, engineers from Shalom EO suggest a dry operation and storage environment.

Hangzhou Shalom EO offers optical-grade-polished LiIO3 crystals with a surface quality of 10/5 Scratch/Dig. A set of coating options could be tailored for you, including AR, BBAR, and P-coating.

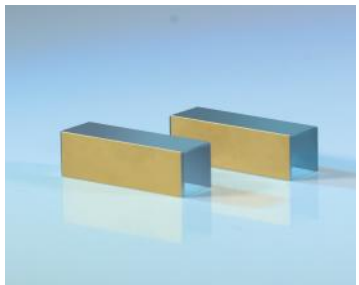
Specifications:

Material	LiIO3 Crystals, Optical-grade	Dimension Tolerance	+/-0.1mm
Surface Quality	10/5 S/D	Parallelism	< 10 arc seconds
Flatness	< Lambda/8@633nm	Perpendicularity	< 5 arc minutes
Transmitting Wavefront Distortion	< Lambda/8@633nm	Aperture	>90%
Chamfer	0.2mmx45degree	Chips	<0.1mm
Coating	AR, BBAR or P-coating		

Basic Properties

Transmission Range	0.5 to 5.0μm	Crystal Structure	hexagonal
Point Group	6	Density	4.487 g/cm3
Mohs Hardness	3.5-4.0	Absorption at 1064nm, cm-1	<0.05
Refractive Indices at 1064nm	no=1.8571, ne=1.7165	Refractive Indices at 800nm	no=1.8676, ne=1.7245
Refractive Indices at 532nm	no=1.8982, ne=1.7480	Phase Matching Range for Type1 SHG(nm)	570-4000
Angular, mradxcm	0.77	Spectral, cm-1 xcm	12.74

LiNbO3 and MgO:LiNbO3 Crystals



- Broad transparent optical range of 0.3 to 5.2 micro
- High nonlinearities and damage threshold
- Non-dopant LiNbO3,MgO (0.6% to 5.0%) doped LiNbO3, and PPLN available
- Offered in blanks/laser-grade-polished/coated modules, with optional electrodes configured
- Versatile Applications: SHG, OPO/OPA, DFM, SFG, EO Modulations, Phase-Matching, TPO (Tera-hertz Wave Parametric Oscillators), Optical Waveguides

LiNbO3 (Lithium Niobate) Crystals are one of the most versatile crystals with their unique electro-optic, piezo-electric properties. In the area of nonlinear optics, the diversified usages of LiNbO3 include frequency conversion, electro-optic modulation, SAW wafers, etc. It is an excellent medium for SHG at wavelengths > 1μm, Optical Parametric Oscillation (OPO), Optical Parametric Amplifiers (OPA), and generation of tunable infrared output by difference frequency mixing (DFM). LiNbO3 features broad spectral transmission (0.3-5.2 micro) ranging from the Visible to MWIR wavelengths and a high laser-induced damage threshold. The large nonlinearities of LiNbO3 also suggest that higher effective nonlinear coefficients (deff) could be achieved at lower power intensities.

Compared with LiNbO3, MgO:LiNbO3 (Magnesium Doped Lithium Niobate) Crystal has a higher optical damage threshold than normal lithium niobate and therefore should be considered for high-power applications. LiNbO3 is susceptible to photorefractive damage, which is a detrimental trait for the conversion of frequencies. The problem could be alleviated using MgO-doped lithium niobate, which is less prone to optical damage. In addition, MgO: LiNbO3 exhibits its particular advantages for Non-Critical Phase Matched (NCPM) Second Harmonic Generation/Doubling Frequencies (SHG) at room temperature, and SFG.

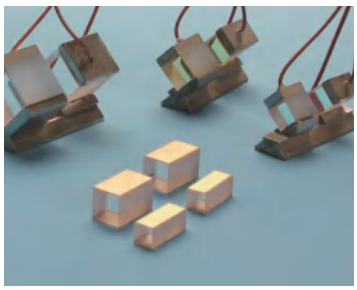
Due to its large Electro-Optic (E-O) coefficients, LiNbO3 crystals are also the ideal medium for manufacturing EO modulators.

Hangzhou Shalom EO provides custom LiNbO3 and MgO(0.6~1.0%)/MgO(5mol%) Doped LiNbO3 Crystals for Nonlinear Optical Processing. The crystals are available in the form of blanks, or laser-grade-polished/coated. Modules with electrodes are available upon your request. Besides, EO Grade LiNbO3/MgO:LiNbO3 Crystals, and Periodical Poled Lithium Niobate (PPLN) Crystals for Quasi Phase Matched (QPM) conversion of frequencies, fabricated Y128/Y36/Y/Z-Cut LiNbO3 SAW Wafers are also accessible in Shalom EO.

Specifications:

Crystal Materials	MgO:LiNbO3 Crystals (MgO doping concentration 0.6-1.0mol% or 5mol%), LiNbO3 Crystal	Dimension	Custom
Width and Height Tolerance	W(+/-0.1mm) x H(+/-0.1mm)	Length Tolerance	+/-0.2mm
Surface Quality	20/10 S/D	Parallelism	<20 arc seconds
Flatness	< Lambda/10 @633nm	Perpendicularity	<5 arc minutes
Perpendicularity	<5 arc minutes	Chamfer	0.2mmx45°
Lateral Surface	Fine ground	Orientation Tolerance	< 10 arc minutes
Wavefront Distortion	<Lambda/4@633nm		

RTP Crystals



- Broad transparent range from 0.35μm to 4.5μm
- High damage threshold (1.8 times the magnitude of KTP)
- High resistivity and high repetition rate
- Surpassing homogeneity and high laser damage threshold
- No acoustic ringing and stability over a wide temperature range(-60℃-+80℃)

RTP (Rubidium Titanyle Phosphate – RbTiOPO4) Crystals are an isomorph of KTP crystals and find great utility in nonlinear and electro-optical applications. It has the advantages of a higher damage threshold(about 1.8 times the magnitude of that of KTP), high resistivity, low absorption loss, non-hygroscopicity, and the absence of induced piezo-electric ringing with the frequencies of electrical input signals up to 60 kHz. Its transmission range is 350nm to 4500nm. The walk-off angle of the crystal, when generating yellow lasers, is miniature, in addition, the crystal is a highly efficient media for lasers of high repetition rates.

Hangzhou Shalom EO offers custom RTP crystals upon customers' request. AR coatings can be furnished. Besides, our RTP Q-Switches have been released for sale, click on the bold text to learn more.

Applications of RTP Crystals:

SHG of Nd-doped lasers at 1064nm
Electro-Optical Q-switch, EO modulation, and optical waveguides
Optical Parametric Amplification (OPA) and Optical Parametric Oscillation (OPO)

Specifications:

Growth Orientation	Along Y-axis	Maximum Length(at 5x5mm)	25mm
Length Tolerance	+0.5mm / -0.1mm	Width and Height Tolerance	+/-0.1mm
Parallelism	< 30″	Perpendicularity	< 15′
Surface Quality	20/10 S/D	Coating	AR-coated

Basic Properties:

Crystal structure	Orthorhombic	Cell Parameters	a = 12.96 Å; b =10.56 Å; c =6.49 Å
Mohs hardness	About 5	Density	3.6 g/cm3
Melting Point	About 1000˚C	Thermal Expansion Coefficients (/K)	αx=1.01x10-5 , αy =1.37x10-5 , αz =-4..17x10-6
Sellmeier Equations (λ in μm)	nx2=2.15559+0.93307[1-(0.20994/λ)2]-0.01452λ2 ny2=2.38494+0.73603[1-(0.23891/λ)2]-0.01583λ2 nz2=2.27723+1.11030[1-(0.23454/λ)2]-0.01995λ2	Thermo-optical Coefficients (dλ/dT)	-0.029nm / °C
Electro-optic Constants (Y-cut) (X-cut)	r33=38.5 pm/V r33=35 pm/V,r23=12.5pm/V, r13=10.6 pm/V	Electrical Resistivity	About 1011-1012ohm·cm
Static Half Wave Voltage at 1064nm	4x4x20mm:1.600V 6x6x20mm:2.400V 9x9x20mm: 3.600 V	Extinction Ratio	>20dB@633nm

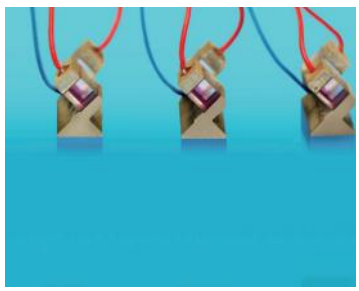
Pockels Cells



A Pockels Cell is an optical device used to switch the polarization direction of light. The core element of a Pockels cell is an electro-optical crystal (e.g. BBO, DKDP, etc.) with metal electrodes attached to its terminal which functions through the Pockels Effect. Pockels cells can be regarded as voltage-controlled waveplates. When light propagates in the electro-optic crystals integrated into the pockels cells and a voltage is applied to the EO crystal, phase retardation is introduced in the transmitted light, which leads to the subsequent change of the polarization direction of light. Therefore the polarization state can be manipulated by adjusting the applied voltage. Because their switching behavior have a strong dependence on the drive electronics, Pockels cells offer a much faster response time than acousto-optic devices. Pockels cells are fundamental components for EO modulators and Q-switches for lasers. Hangzhou Shalom EO offers the pockels cells made from DKDP crystals, BBO crystals and LiNbO3 or MgO:LiNbO3 crystals.

Hangzhou Shalom EO offers off-the-shelf and custom Pockels Cells with high damage threshold, low insertion loss, and competitive price, various substrate materials are available: DKDP, BBO, LiNbO3, MgO: LiNbO3 pockels cells. Shalom EO also offers the polished, coated DKDP, BBO, and LiNbO3 crystals with Cr-Au electrodes for EO applications.

RTP Q-Switch



- Ideal for EO modulation at high repetition rates
- High damage threshold capable of handling high-power lasers
- High extinction ratio and low half-wave voltage
- Both stocked and custom versions available could be sold in matched pairs or as single crystal
- Applications: Laser Ranging, Laser Radar, medical laser, Industrial Laser, Laser power/phase modulation, Pulse Picker

RTP (Rubidium Titanyle Phosphate – RbTiOPO4) is an isomorph of KTP crystal that is used in nonlinear and Electro-Optical applications. RTP crystals are an excellent alternative EO modulation for high-power lasers due to a combination of their high damage thresholds with large nonlinear optical and electro-optical coefficients. The Crystal is also advantageous in the aspects that it induces no piezoelectric ringing and is not susceptible to dampness. In addition, it requires a low half-wave voltage to operate.

Hangzhou Shalom EO offers Standard and Custom RTP Q-Switches to generate pulsed laser output with high peak power. Our RTP Q switch exhibits superior capabilities for EO modulations at high repetition rates, including Laser Ranging, Laser Radar, lasers for medical treatment and lasers for industrial manufacturing, Laser power/phase modulation, Pulse Picker, etc. with a high extinction ratio greater than 20dB, and a high damage threshold of 600MW/cm2 10ns 10Hz at 1064nm. Over the years, we have been proceeding with and breaking through the fabrication technique of the RTP crystals to attain reproducible high qualities. We could offer RTP Crystal Q-Switch in two versions: in matched pairs or as a single crystal.

The standard RTP Q-switch is available in dimensions from 2x2x5mm to 10x10x5mm, whilst other custom dimensions and specifications are accessible upon request. Regarding the coating, we provide a 1064nm anti-reflection (R<0.2%) standard coating, or other custom coatings could be tailored. Besides, we also provide RTP crystals that are fit for a wide range of nonlinear optical applications.

Specifications:

Dimensional Tolerance	W(+/-0.1) x H(+/-0.1) x L(+0.5/-0.1) mm
Parallelism	≤5″
Surface Quality	20/10 S/D
Flatness	λ/10@633nm
Transmitted Wavefront Distortion	λ/6@633nm
Extinction Ratio	>20dB
Coating	AR@1064nm(R<0.2%), or Custom
Damage Threshold	600MW/cm^2 10ns 10Hz at 1064nm

Material Properties:

Crystal structure	Orthorhombic
Cell Parameters	a = 12.96 Å; b =10.56 Å; c =6.49 Å
Mohs hardness	5
Density, g/cm3	3.6
Melting Point:	~ 1000°C
Ferroeletric transition temp.	~ 810°C
Color	Colorless
Thermal Expansion Coefficients (/K)	αx=1.01x10-5, αy =1.37x10-5, αz =-4.17x10-6
Dielectric Constant	Eeff= 13.0
Thermo-optical coefficients (dλ/dT)	-0.029 nm / °C
Electro-optic constants	Y-cut: r51=38.5 pm/V X-cut: r33=35 pm/V,r23=12.5 pm/V, r13=10.6 pm/V
Nonlinear Coefficients:	d15 = 2.0 pm/V; d24 = 3.6 pm/V; d31= 2.0 pm/V d32 = 3.6 pm/V; d33 = 8.3 pm/V
Electrical Resistivity	around 1011-1012ohm·cm
Hygroscopic	no
Static Half Wave Voltage at 1064 nm	4x4x20 mm: 1,600 V 6x6x20 mm: 2,400 V
Transmitting range:	350~4500 nm
Sellmeier equations(λ in um)	nx2=2.15559 + 0.93307[1-(0.20994/λ)2] - 0.01452λ2 ny2=2.38494 + 0.73603[1-(0.23891/λ)2] - 0.01583 λ2 nz2=2.27723 + 1.11030[1-(0.23454/λ)2] - 0.01995λ2

Product List of RTP Q-Switch

Type	Size of Single Crystal(mm)	Length of Holder(mm)	Half-wave voltage(V)
QR2205A	2X2X5	12	1600V
QR3305A	3X3X5	14	2400V
QR4405A	4X4X5	14	3200V
QR4410A	4X4X10	25	1600V
QR6605A	6X6X5	14	4800V
QR6610A	6X6X10	25	2400V
QR8805A	8X8X5	14	6400V
QR8810A	8X8X10	25	3200V
QR1005A	10X10X5	14	8000V

DKDP Pockels Cells



- High Deuteration (>98.0%) DKDP Crystal
- Broad Wavelength Range: 0.3~1.1μm
- Maximum Aperture: 50mm
- High Transmission: >98%
- Pockels Cells with Double DKDP crystals available
- Custom Modules Available

DKDP or KD*P crystals stand out for their high electro-optic coefficients attributing to the high deuteration content, and the high e-o conversion efficiencies render them well-suited for pockels cells Q-switches applications. DKDP crystals also have good transmission at 0.3 to 1.1μm. The operation wavelength range of DKDP (KD*P) Pockels cells for Q-switching applications is 400 nm to about 1.1 μm. Most of the low repetition rate DPSS Nd:YAG lasers and commercial flashlamp-pumped Nd:YAG lasers are equipped with DKDP (KD*P) based Pockels cells for laser cavity Q-switching. With the distinguished merits of excellent mechanical and optical properties, DKDP Pockel cells are often used in lasers of large caliber, high power, and narrow pulse width.

Hangzhou Shalom EO offers the DKDP pockels cells with high deuteration (>98%), low capacitance and fast rise time and high transmission, high extinction ratio, and the largest aperture of 50mm is available.

Features:

Low absorption and high deuteration
Operates in the Longitudinal scheme, so applied voltage does not depend on crystal aperture, hence large apertures could be arranged without increasing the voltage
High damage threshold dielectric AR coating options
For fs applications due to low GVD

Applications:

Pulse picking and Laser cavity dumping
Q-switching of low repetition rate diode-pumped lasers and flashlamp-pumped high energy lasers
OEM laser systems
Medical/cosmetic lasers
Versatile R&D laser platforms
Military & aerospace lasers

Common Specifications:

Deuteration of DKDP Crystals	>98%	Wavelength Range	300nm to 1400nm
Aperture	≦ 50mm	Wavefront Distortion	Lambda/8@633nm
Capacitance	~3pF	Quarter Wave Voltage	~3200V
Transmission (@designed wavelength)	>98%		

Product List of DKDP Pockels Cells

Code	Types	Wavelength	Dimension	Aperture	Extinction Ratio	Laser Damage Threshold	Unit Price
2031-004	High ER	Custom	Φ15×18mm	5mm	>5000:1	500MW/cm^2	Inquire
2031-005	Customized	Custom	Φ18x25mm	6mm	CP>2500:1; PP>1500:1	>800MW/cm^2	Inquire
2031-001	Pin connectors	1064nm	Φ19x29mm	8mm	>2500:1	800MW/cm^2	$450.0
2031-006	Customized	Custom	Φ18x25mm	8mm	CP>2500:1; PP>1500:1	>800MW/cm^2	Inquire
2031-007	Compositive	500-1100nm	60x30x30mm	8mm	>2500:1	>800MW/cm^2	Inquire
2031-025	High ER	Custom	Φ19x24mm	8mm	>5000:1	500MW/cm^2	Inquire
2031-026	High ER	Custom	Φ19x24.7mm	8mm	>5000:1	500MW/cm^2	Inquire
2031-008	High ER	240-1400nm	Φ19×24mm	8mm	>7000:1	750MW/cm^2	Inquire
2031-009	High ER	240-1400nm	Φ19×24.7mm	8mm	>7000:1	750MW/cm^2	Inquire
2031-002	Pin connectors	1064nm	Φ25x39mm	10mm	2500:1	800MW/cm^2	$500.0
2031-010	Pin connectors	500-1100nm	Φ25.4x39mm	10mm	>2500:1	>800MW/cm^2	Inquire
2031-027	High ER	Custom	Φ25.4x32mm	10mm	>5000:1	500MW/cm^2	Inquire
2031-028	High ER	Custom	Φ25.4x39mm	10mm	>5000:1	750MW/cm^2	Inquire
2031-011	High ER	240-1400nm	Φ25.4x32mm	10mm	>7000:1	750MW/cm^2	Inquire
2031-012	High ER	240-1400nm	Φ25.4x39mm	10mm	>7000:1	750MW/cm^2	Inquire
2031-013	High ER	240-1400nm	Φ28x33mm	11mm	>7000:1	750MW/cm^2	Inquire
2031-003	Pin connectors	1064nm	Φ28x33mm	12mm	2500:1	800MW/cm^2	$600.0
2031-024	755nm double connectors	755nm	Φ25.4x39mm	12mm	>2000:1	>850MW/cm^2	Inquire
2031-014	755nm triple connectors	755nm	Custom	12mm	>2000:1	>850MW/cm^2	Inquire
2031-015	Pin connectors	500-1100nm	Φ25.4x39mm	12mm	>2500:1	>800MW/cm^2	Inquire
2031-016	694nm	694nm	Custom	12mm	>2500:1	>800MW/cm^2	Inquire
2031-029	High ER	Custom	Φ34.5x41.2mm	12mm	>5000:1	500MW/cm^2	Inquire
2031-030	High ER	Custom	Φ25.3x42.5mm	13mm	>5000:1	500MW/cm^2	Inquire
2031-017	High ER	240-1400nm	Φ25.3x42.5mm	13mm	>7000:1	750MW/cm^2	Inquire
2031-018	Large aperture	1064nm	Φ55x80mm	25mm	>1500:1	>850MW/cm^2	Inquire
2031-019	Large aperture	1064nm	Φ55x80mm	30mm	>1000:1	>850MW/cm^2	Inquire
2031-020	Large aperture	1064nm	Custom	50mm	>700:1	>850MW/cm^2	Inquire
2031-021	Wire connector	Custom	Φ32x41mm	Custom(<12mm)	>2500:1	>800MW/cm^2	Inquire
2031-022	Wire connector	Custom	Φ28x33mm	Custom(<12mm)	>2500:1	>800MW/cm^2	Inquire
2031-023	Nitrogen encapsulated	500-1100nm	Φ25x36mm	Custom(>10mm)	>5000:1	>1GW/cm^2	Inquire

LiNbO3 and MgO:LiNbO3 Pockels Cells



- Low Half Wave Voltage
- High Electro-Optical Coefficients
- Operate in transverse Mode
- Long Wavelength up to 4μm
- Preferable for Er:YAG, Ho:YAG and Tm:YAG lasers

LiNbO3 and MgO: LiNbo3 crystals are a kind of photoelectric material that has been integrated into a wide range of applications on account of their excellent electro-optical characteristics, low cost, and excellent mechanical, thermal, and chemical properties. The electro-optic characteristic of LiNbO3 crystals is utilized for electro-optical modulations. Lithium Niobate crystals have become one of the most popular electro-optical materials for Q-switches and phase modulators attributed to their large electro-optic coefficients, non-deliquescence, good transmission up to 4.0 μm, and low half wave voltage. Operating in the transverse mode, LiNBO3 Pockels cells can be configured to run at a lower voltage than KD*P Pockels cells. LiNbO3 Pockels cells could support operations in infrared wavelengths up to 4.0 μm, and are also great choices for applications in low and medium-power solid-state lasers (Er:YAG, Ho:YAG, Tm:YAG pulsed lasers). Damage threshold could be problematic for lithium-niobate at short wavelengths because of color center formation. Above 800nm, however, the problem attenuates and the material then has a decent damage threshold. On the other hand, LiNbO3 with MgO doping has a much higher damage threshold than conventional LiNbO3 without doping.

Hangzhou Shalom EO offers pockels cells made from LiNbO3 crystals and MgO:LiNbO3 crystals, with aperture size of 2.5mm to 9mm. The LiNbO3 and MgO:LiNbO3 crystals with Cr-Au electrode for electro-optical modulators or pockels cells are also offered.

Features:

Wide range of optical transmission (420 nm to 5200 nm)
Large electro-optical coefficients and low loss
Stable mechanical and chemical properties
High-temperature endurance and low wavefront distortion

Applications:

Q-switching compact Nd+ lasers such as range-finders
Target designators
Medical and industrial lasers

Modules or Types:

Aperture	2.5mm	5mm	8mm	9mm
Shell Size	φ20 x 66mm	φ25.4 x 36mm	φ30/32 x 26/30mm	φ31/32 x 26mm
λ/4 Voltage	400V λ/2 @ 633nm	800V λ/2 @ 633nm	1800V-1900V λ/4 @1064nm	2100V λ/4 @ 1064nm
Overall Transmittance	>98%	>98%	>98%	>98%
Insertion Loss	3%	3%	3%	3%
Output Tuning Q Energy	100mJ	100mJ	100mJ	100mJ
Crystal Through Distortion	λ/4 @ 633nm	λ/4 @ 633nm	λ/4 @ 633nm	λ/4 @ 633nm
Flatness	λ/8 @ 633nm	λ/8 @ 633nm	λ/8 @ 633nm	λ/8 @ 633nm
Extinction Ratio	200:1 at 5mm section	200:1 at 5mm section	200:1 at 5mm section	200:1 at 5mm section
Capacitance	5pF	5pF	5pF	5pF
Damage Threshold	100MW/cm2 1064nm 10ns 10Hz (LN switch) 300MW/cm2 1064nm 10ns 10Hz (MgO: LN switch)			

Specifications:

Aperture	Min. 5x5mm Max. 20x20mm	Length	~60mm
Orientation	12 arc min	Flatness	λ/8 @ 633nm
Wavefront Distortion	λ/4 @ 633nm	Parallelism	< 20 arc sec
Perpendicularity	< 5 arc sec	Surface Quality	10/5 after coating 20/10
Wavelength	300-3000nm		

Product List of LiNbO3 and MgO:LiNbO3 Pockels Cells

Code	Wavelength	Dimension	Aperture	Extinction Ratio	Laser Damage Threshold	Unit Price
2033-001	1064nm	55x28x24mm	2.5mm	>500:1	200MW/cm^2	Inquire
2033-002	1064nm	55x28x24mm	5mm	>500:1	200MW/cm^2	Inquire
2033-003	1064nm	55x28x24mm	8mm	>500:1	200MW/cm^2	Inquire
2033-004	1064nm	55x28x24mm	9mm	>500:1	200MW/cm^2	Inquire
2033-005	Custom	Crystal size: 4x4x15mm	3.6(+/-0.1)mm	>100:1	100MW/cm^2	Inquire
2033-006	Custom	Crystal size: 6x6x20mm	5.4(+/-0.1)mm	>100:1	100MW/cm^2	Inquire
2033-007	Custom	Crystal size: 9x9x25mm	7.2(+/-0.1)mm	>100:1	100MW/cm^2	Inquire
2033-008	Custom	Crystal size: 10x10x20mm	9(+/-0.1)mm	>100:1	100MW/cm^2	Inquire

BBO Pockels Cells



- High Repetition Rate and Damage Resistance
- Low Absorption and Acoustic Noise
- High Ultra-Violet Transmission
- Pockels Cells with Double Crystals available
- Applications: High repetition rate DPSS Q-switches, High Repetition Rate Regenerative Amplifier Control, Cavity
- Dumping and Beam Chopper

Beta BBO Pockels Cells or beta barium borate pockels cells exhibit significant advantages over other materials in terms of laser power handling abilities, temperature endurance, and substantial freedom from piezoelectric ringing. Beta BBO Pockels cells are the most attractive candidates for high repetition rate Q-switching, pulse picking at up to 3 MHz, laser cavity dumping, regenerative amplifier control, and beam chopper. BBO pockels cells are a better option than KDP pockels cells in the field of high repetition rate and high power applications. On account of the low piezoelectric coupling coefficients of the top-notch-quality BBO crystals that we incorporate into our Pockels Cells, our BBO Pockels cells are capable of generating pulses with repetition rates of hundreds of kilohertz.

Hangzhou Shalom EO offers off-the-shelf and custom BBO Pockels Cells with high damage threshold, low insertion loss, high extinction ratio, minimal piezoelectric ringing, and competitive price. BBO Pockels Cells with both Single and double BBO crystal designs and low-voltage geometries are available upon request. Besides, we also offer BBO crystals for EO applications.

Features:

BBO Pockels cells are the best choice for high repetition rate Q-switching
High damage threshold and power handling capability
Wide Transmission range from UV to NIR
Low absorption and absence of piezoelectric ringing
Relatively high half-wave voltage

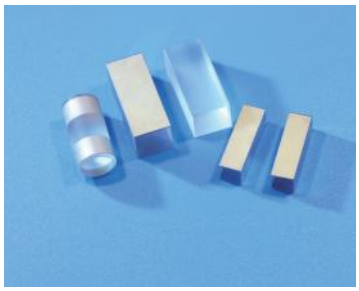
Specifications of BBO Pockels cells

Aperture	TBA	Quarter-wave voltage	3.4KV
Optical Transmission	>98%	Damage Threshold	500MW/cm2 @ 10ns, 1064nm
Wavefront Distortion @ 1064	< Lambda/8	Typical Capacitance	< 3pF
Outline Dimension	φ25.4 x 44mm		
Wavelength	300-3000nm		

Product List of BBO Pockels Cells

Code	Types	Wavelength	Dimension	Aperture	Extinction Ratio	Laser Damage Threshold	Unit Price
2035-001	Double-crystal	410-3500nm	Φ25.4×67mm	1.8mm	>500:1	>500MW/cm^2	Inquire
2035-003	Single-crystal	410-3500nm	Φ25.4×39mm	1.8mm	>1000:1	>500MW/cm^2	Inquire
2035-004	Double-crystal	410-3500nm	Φ25.4×67mm	2.5mm	>500:1	>500MW/cm^2	Inquire
2035-005	Single-crystal	410-3500nm	Φ25.4×39mm	2.5mm	>1000:1	>500MW/cm^2	Inquire
2035-014	Single-crystal	Custom	Φ25.4x36mm	2.5mm	>3000:1	500MW/cm^2	Inquire
2035-006	Single-crystal	Custom	Φ25.4×35mm	2.6mm	>1000:1	750MW/cm^2	Inquire
2035-007	Single-crystal	Custom	Φ25.4×40mm	2.6mm	>1000:1	750MW/cm^2	Inquire
2035-008	Double-crystal	410-3500nm	Φ25.4×67mm	3.6mm	>500:1	>500MW/cm^2	Inquire
2035-009	Single-crystal	410-3500nm	Φ25.4x39mm	3.6mm	>1000:1	>500MW/cm^2	Inquire
2035-010	Single-crystal	Custom	Φ25.4×35mm	3.6mm	>1000:1	750MW/cm^2	Inquire
2035-011	Single-crystal	Custom	Φ25.4×40mm	3.6mm	>1000:1	750MW/cm^2	Inquire
2035-012	Single-crystal	Custom	Φ25.4×35mm	4.6mm	>1000:1	750MW/cm^2	Inquire
2035-013	Single-crystal	Custom	Φ25.4×40mm	4.6mm	>1000:1	750MW/cm^2	Inquire

Electro-Optic (EO) Crystals and Acousto-Optic (AO) Crystals



Electro-optic Crystals (EO Crystals) are crystals that demonstrate a certain linear electro-optic effect called the Pockels Effect. In the Pockels Effect, when an external electric field is applied to the electro-optic crystal, the refractive indices of the crystals are changed in proportion to the magnitude of the electric field. Although the change in refractive indices introduced by the electric field is minute, it is enough to cause the characteristics of light propagation in the crystal to change, so that mutual conversion of electro-optic signals and modification of light can be achieved. EO crystals are oriented for manufacturing electro-optic modulators (EOM) which are used to control the amplitude (amplitude modulators), phase (phase modulation), or the polarization state of light. And E-O modulations could be divided into longitudinal EO modulation in which the directions of electric field and light propagation are the same and transverse EO modulation in which the directions of electric field and light propagation are orthogonal. KDP crystals are often used in the longitudinal scheme, whilst LiNbO3, MgO:LiNbO3, ZnO:LiNbO3, BBO, and KTP crystals are often used in the transverse scheme.

Acousto-optic Crystals (AO Crystals) are crystals that exhibit the Acousto-optic effect, which is a phenomenon based on the change in refractive index of a medium due to the presence of sound waves in the medium. By interaction between the refractive characteristic of the material and the oscillating mechanical strain, the sound waves then create a diffraction grating in the crystal. AO crystals are often assembled with an acoustic absorber and a piezoelectric transducer to compose an acousto-optic modulator (AOM), which can be utilized for manipulating the transmitted power of a laser beam with an electrical drive signal.

Hangzhou Shalom EO offers off-the-shelf and custom electro-optic and acousto-optic crystals for EO and AO modulations and pockels cells. The crystals feature rich dimension/orientation options, large apertures, while also boasting high-precision polishing, and different kinds of coatings, Cr-Au electrodes can be furnished. various substrate materials are available: DKDP, BBO, LiNbO3, MgO:LiNbO3, TeO2, and HGTR-KTP crystals. Crystals could be offered in the forms of crystal boules, crystal blanks, and crystals with AR coatings and electrodes. Shalom EO also offers stocked and custom DKDP, BBO, and LiNbO3 / MgO:LiNbO3 Pockels Cells.

Below is a brief selection guide:

DKDP: It has the advantages of low half-wave voltage, large linear electro-optic coefficient, wide transmission band, and good optical homogeneity. However, it is hygroscopic.

LiTaO3: LiTaO3 has a higher electro-optical coefficient than LiNbO3, a high optical damage threshold, low birefringence, and high light transmittance.

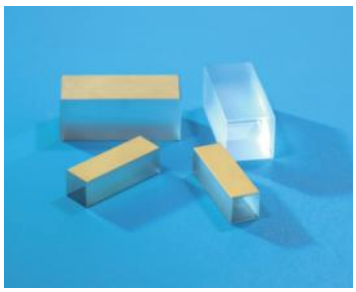
LiNbO3: It has low half-wave voltage and stable physical/chemical properties, suitable for solid-state lasers with low-to-medium frequencies.

BBO: It is the best choice for high-power applications and high repetition DPSS Q-switching due to its superior damage threshold and wide optical transmission wavelength range. However, it requires high voltages.

KTP: It has high electro-optic coefficients and low dielectric constant, being capable of operations with a high repetition rate.

TeO2: Tellurium Dioxide (TeO2) crystals are one of the most popular acousto-optic crystals used in laser applications due to their large elastic-optic coefficient and high refractive index.

BBO Crystals for EO Applications



- Stocked BBO crystals available
- High Repetition Rate and UV Transmission
- High Peak Power Damage Resistance
- Low Absorption and Acoustic Noise
- High Precision Polishing and Cr-Au Electrodes

BBO crystals or beta barium borate crystals exhibit significant advantages over other materials in terms of laser power handling abilities, high damage threshold temperature stability, and substantial freedom from piezoelectric ringing. Beta BBO crystals are the most attractive candidates for high repetition rate Q-switching, pulse picking at up to 3 MHz, laser cavity dumping, regenerative amplifier control, and beam chopper. Beta barium borate (BBO) crystal is an excellent electro-optic crystal for high-power applications at the wavelength range from 200nm to 2,500nm.

Hangzhou Shalom EO offers BBO crystals used in the pockels cells with high precision polishing, AR coating, and Cr-Au electrodes at and competitive price. Stocked crystals of standard specifications are ready for selection, and customized special crystals are available upon the customer's request.

Features:

They are the best choice for high repetition rate Q-switching
High damage threshold and power handling capability
Wide Transmission range from UV to NIR
Low Absortion and piezoelectric ringing
high half wave voltage

Common Specifications:

Materials	Beta BBO crystals	Size Tolerance	L(±0.1mm)W(±0.1mm)H(+0.5/-0.1mm)
Cut Angle	Z-Cut	Clear Aperture	central 90% or the diameter
Scattering of Crystals	No visible scattering paths or centers	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/8 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤20 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	≤0.25°	Coating	AR/AR on both end surfaces Cr-Au electrode on two side surfaces
Quarter-wave voltage	TBA	Optical Transmission	>98%
Typical capacitance	3pf	Damage Threshold	>500MW/cm^2 @1064nm, 10nS
Quality Warranty Period	one year under proper use		

Physical properties of BBO:

Crystalline structure	Trigonal, space group R3c, Point group 3m	Cell Parameters	a = b = 12.532 Å, c = 12.717Å, Z = 6
Melting point	1095±5℃	Phase transition point	925±5℃
Optical Homogeneity	δn ~ 10-6 /cm	Mohs hardness	4
Density	3.85 g/cm3	Specific heat	1.91J/cm3 xK
Hydroscopicity	Low	Thermal expansion coefficients	a,4 x 10-6/K;c, 36x 10-6/K
Thermal Conductivity	⊥ c,1.2W/m/K; //c, 1.6W/m/K	Absorption Coefficient	< 0.1% /cm (at 1064 nm)

Optical properties of BBO:

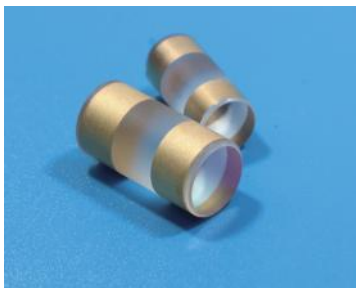
Transparency Range	189-3500 nm	Refractive Indices at 1064 nm at 800 nm at 532 nm at 400 nm at 266 nm	no = 1.6545, ne = 1.5392 no = 1.6606, ne = 1.5444 no = 1.6742, ne = 1.5547 no = 1.6930, ne = 1.5679 no = 1.7585, ne = 1.6126
Thermo-optic Coefficients	dno/dT = -9.3 x 10-6 /°C dne/dT = -16.6 x 10-6 /°C	Electro-optic Coefficients	γ11 = 2.7 pm/V, γ22, γ31 < 0.1 γ11
Effective Nonlinearity Expressions	dooe= d31 sinθ +(d11 cos3φ - d22 sin3φ) cosθ deoe= (d11 sin3φ + d22 cos3φ) cos2θ	Half-wave Voltage	48 kV (at 1064 nm)
NLO Coefficients	d11 = 5.8 x d36(KDP) d31 = 0.05 x d11 d22 < 0.05 x d11	Damage Threshold (Bulk) at 1064 nm at 532 nm	5 GW/cm2 (10 ns); 10 GW/cm2 (1.3 ns) 1 GW/cm2 (10 ns); 7 GW/cm2 (250 ps)
Phase-matchable SH Wavelengths:	189 - 1750 nm		

Product List of BBO Crystals for EO Applications:

Code	Material	Size	Orientation	Unit Price
2041-001	Beta BBO	3x3x20mm	Z-cut	$380
2041-002	Beta BBO	4x4x20mm	Z-cut	$545
2041-003	Beta BBO	4x4x25mm	Z-cut	$685

DKDP Crystals for EO Applications





- High Deuteration (>98.0%) DKDP Crystals
- Broad Wavelength Range: 0.3~1.1μm
- Maximum Aperture: 50mm
- High Transmission: >98%
- Cr-Au Electrode

KD*P or DKDP crystals are widely used in Q-switching applications at wavelength range from 0.25μm to approximately 1.1 μm, If the deuterium content is higher the absorption edge of the material is shifted further into the infrared. KD*P crystal with a deuterium content >98% can be used up to 1.3μm. KD*P can be grown with high optical uniformity and is therefore recommended for requirements of large apertures.

Hangzhou Shalom EO offers the DKDP crystals of high deuteration (>98%) for KD*P pockels cells applications, the customized blanks, polished crystals, and the AR coating and Cr-Au electrode crystal components are available upon your request.

Modules or Types:

Various forms of crystals are available upon your request:
Crystal boules with inspection polishing
Crystal blanks with inspection polishing
Crystals with laser grade polishing
Crystals with AR coating and Cr-Au electrode

Specifications:

Crystal Materials	DKDP crystals (deuteration level >98%)	Typical Diameter	6mm; 8mm; 10mm; 12mm; 15mm
Diameter Tolerance	+/-0.1mm	Length Tolerance	+/-0.2mm
Surface Quality	20/10 S/D	Parallelism	<20 arc seconds
Flatness	< Lambda/10 @633nm	Chamfer	0.1-0.3mmx45°
Chips	<0.15mm	Fine ground	<0.15mm
Orientation Tolerance	< 10 arc minutes	Wavefront Distortion	<Lambda/8@633nm
Extinction Ratio	>2000:1	Coating	AR/AR@1064nm or customized
Damaging Threshold	>800mW/cm^2@1064nm 10nS 10Hz pulse	Electrode on Side Surface	Chrome gold electrode (Cr+Au)
Quarter Wave Voltage	~3.4KV		

Basic Properties of DKDP crystals

Chemical Formula	KD2P	Curie Temperature	222K
Symmetry	42m	Density	2.355g/cm3
Absorption	0.005/cm	Extinction Ratio	1:10000
Deuterium Ratio	98.05%--99.05%	Transmission Band	200-1600nm
Non-linear Coefficient	d36=0.40pm/v	Longitudinal Half-wave Voltage	2.98KV(l=546nm)
Electric Resistance	>2x109Ω/cm	Electric-optical Coefficient	r41=8.8pm/v,r63=25pm/v

LiNbO3 Crystals for EO Applications



- Off-the-shelf and customized crystals
- Low Half Wave Voltage
- High Electro-Optical Coefficients
- Laser grade polishing, AR coating and Cr-Au electrodes
- Brewster angle cut LiNbO3 crystals for low amplification laser
- Applications: Electro-optic pockels cells, Q-switches and phase modulators

Lithium niobate (LiNbO3) crystals demonstrate maltitude photoelectric effects, including piezoelectric effect, electro-optic effect, nonlinear effect, photorefractive effect, photovoltaic effect, and photoelastic effect, acousto-optic effects and other optoelectronic properties, for this, LiNbO3 has been used in various applications such as Surface Acoustic Wave (SAW) filters, Electro-optic (EO) pockels cells, Phase Modulators, Optical Modulators, Optical Isolators, Optical Parametric Oscillators (OPO), Difference-Frequency Generation (DFG), Second Harmonic Generation (SHG), etc.

The lithium niobate crystals (LiNbO3) exhibit stable physical and chemical properties and are easy to process. Lithium niobate crystals have a wide light transmission range (0.3-5μm) and large electro-optic coefficients, which render them one of the most commonly used materials for EO pockels cells, optical modulators, and phase modulators with the advantage of low half-wave voltage and zero residual birefringences. However, LiNbO3 has a drawback of low damage threshold, therefore LiNbO3 pockels cells and modulators are fit for low and middle-power lasers. The damage threshold could be improved by MgO doping in LiNbO3, MgO:LiNbO3 has a higher damage threshold and could be utilized in high-power lasers.

Hangzhou Shalom EO offers off-the-shelf and custom LiNbO3 crystals and MgO:LiNbO3 crystals used for EO application of pockels cells and optical modulators, every piece of LiNbO3 crystals are under strict supervision and quality control, the AR coatings and Cr-Au electrodes are available upon request.

Common Specifications:

Crystal Materials	LiNbO3 crystals	Size	Customized
Size Tolerance	+/-0.1mm	Length Tolerance	+/-0.2mm
Surface Quality	20/10 S/D	Parallelism	<20 arc seconds
Flatness	< Lambda/10 @633nm	Chamfer	0.1-0.3mmx45°
Chips	<0.15mm	Side Surface	Fine ground
Orientation Tolerance	< 10 arc minutes	Wavefront Distortion	<Lambda/4@633nm
Extinction Ratio	>200:1	Coating	AR/AR@1064nm or customized
Damaging Threshold	>100mW/cm^2@1064nm 10nS 10Hz pulse	Electrode on Side Surface	Chrome gold electrode (Cr+Au)

Basic Properties:

Crystal Structure	Trigonal, space group R3c	Cell Parameters	a = 5.15 Ang, c = 13.863Ang., Z = 6
Melting Point	1255±5℃	Curie Point	1140±5℃
Mohs Hardness	5	Density	4.64 g/cm3
Absorption Coefficient	~ 0.1%/cm @ 1064nm	Solubility	insoluble in H2O
Relative Dielectric Constant	eT11/e0: 85 eT33/e0: 29.5	Thermal Expansion Coefficients(@ 25℃)	||a, 14.1 x 10-6 /K ||c, 4.1 x 10-6 /K
Thermal Conductivity	38 W /m /K @ 25℃		

Linear Optical Properties:

Transparency Range	420-5200nm	Optical Homogeneity	~ 5 x 10-5 /cm
Refractive Indices	ne=2.146, no = 2.220 @ 1300nm ne= 2.156, no = 2.232 @ 1064nm ne= 2.203, no = 2.286 @ 632.8nm	Sellmeier Equations (λ in mm)	n2o (l) = 4.9048+0.11768/(l2 - 0.04750) - 0.027169l2 n2e (l) = 4.5820+0.099169/(l2 - 0.04443) - 0.021950l2

Nonlinear Optical Properties:

NLO Coefficients	d33 = 34.4 pm/V d31 = d15 = 5.95 pm/V d22 = 3.07 pm/V	Efficiency NLO Coefficients	deff =5.7 pm/V or ~14.6 x d36 (KDP) for frequency doubling 1300nm deff =5.3 pm/V or ~13.6 x d36(KDP) for OPO pumped at 1064nm deff =17.6 pm/V or ~45 x d36(KDP) for quasi-phase-matched structure
Electro-Optic Coefficients	gT33 = 32 pm/V, gS33 = 31 pm/V gT31 = 10 pm/V, gS31=8.6 pm/V gT22 = 6.8 pm/V, gS22= 3.4 pm/V	Half-Wave Voltage, DC Electrical field||z, light ^z Electrical field||x or y, light||z	3.03 KV 4.02 KV

Product List of LiNbO3 Crystals for EO Applications

Code	Material	Size	Orientation	Coating	Unit Price
2043-001	LiNbO3	9x9x18.8mm	Z-cut	AR/AR@1064nm Cr+Au electrode	$365
2043-002	LiNbO3	9x9x25mm	Z-cut	AR/AR@1064nm Cr+Au electrode	$365
2043-003	LiNbO3	10x10x20mm	Z-cut	AR/AR@1064nm Cr+Au electrode	$365

MgO:LiNbO3 Crystals for EO Applications





- Low Half Wave Voltage
- High Electro-Optical Coefficients
- Brewster angle for laser of low amplification
- Higher Damage Threshold than none doping LiNbO3
- Preferable for Er:YAG, Ho:YAG and Tm:YAG lasers

MgO:LiNbO3 crystals have become one of the most broadly used materials for Q-switches and phase modulators for their high EO coefficients, MgO:LiNbO3 has a higher damaging threshold than the non-doping LiNbO3 crystals. With an electric field applied transverse to the direction of light propagation, Pockels cells based on LiNbO3 can be configured to operate at a lower voltage than Pockels cells based on KD*P. LiNbO3 can also be a good choice for infrared wavelengths up to 3.0μm.
Hangzhou Shalom EO offers high-quality polished, AR coating and Au-Cr electroded MgO:LiNbO3 crystals used in pockels cells, the MgO doping of 0.6%,1.0%, and 5% is available.

Modules or Types:

Various types of crystals are available upon your request:
Crystal boules with inspection polishing
Crystal blanks with inspection polishing
Crystals with laser grade polishing
Crystals with AR coating and Cr-Au electrode

Common Specifications:

Crystal Materials	MgO(5mol%):LiNbO3 crystals	Size	Customized
Size Tolerance	+/-0.1mm	Length Tolerance	+/-0.2mm
Surface Quality	20/10 S/D	Parallelism	<20 arc seconds
Flatness	< Lambda/10 @633nm	Chamfer	0.1-0.3mmx45°
Chips	<0.15mm	Side Surface	Fine ground
Orientation Tolerance	< 10 arc minutes	Wavefront Distortion	<Lambda/4@633nm
Extinction Ratio	>200:1	Coating	AR/AR@1064nm or customized
Damaging Threshold	>300mW/cm^2@1064nm 10nS 10Hz pulse	Electrode on Side Surface	Chrome gold electrode (Cr+Au)

Basic Properties:

Crystal Structure	Trigonal, space group R3c	Cell Parameters	a = 0.515, c = 13.863, Z = 6
Melting Point	1255±5℃	Curie Point	1140±5℃
Mohs Hardness	5	Density	4.64 g/cm3
Absorption Coefficient	~ 0.1%/cm @ 1064nm	Solubility	insoluble in H2O
Relative Dielectric Constant	eT11/e0: 85 eT33/e0: 29.5	Thermal Expansion Coefficients(@ 25℃)	||a, 2.0 x 10-6 /K ||c, 2.2 x 10-6 /K
Thermal Conductivity	38 W /m /K @ 25℃		

Linear Optical Properties:

Transparency Range	420-5200nm	Refractive Indices	ne=2.146, no = 2.220 @ 1300nm ne= 2.156, no = 2.232 @ 1064nm ne= 2.203, no = 2.286 @ 632.8nm
Optical Homogeneity	~ 5 x 10-5 /cm	Sellmeier Equations (λ in mm)	n2o (λ) = 4.9048+0.11768/(l2 - 0.04750) - 0.027169l2 n2e (λ) = 4.5820+0.099169/(l2 - 0.04443) - 0.021950l2

Linear Optical Properties:

NLO Coefficients	d33 = 34.4 pm/V d31 = d15 = 5.95 pm/V d22 = 3.07 pm/V	Efficiency NLO Coefficients	deff =5.7 pm/V or ~14.6 x d36 (KDP) for frequency doubling 1300nm deff =5.3 pm/V or ~13.6 x d36(KDP) for OPO pumped at 1064nm deff =17.6 pm/V or ~45 x d36(KDP) for quasi-phase-matched structure
Electro-Optic Coefficients	gT33 = 32 pm/V, gS33 = 31 pm/V gT31 = 10 pm/V, gS31=8.6 pm/V gT22 = 6.8 pm/V, gS22= 3.4 pm/V	Half-Wave Voltage, DC Electrical field||z, light ^z Electrical field||x or y, light||z	3.03 KV 4.02 KV

HGTR-KTP Crystals for EO Applications



- Low insertion loss, low quarter-wave voltage
- High repetition rate and wide optical bandwidth
- Higher gray track resistance than regular KTP (5X-10X)
- High damaging threshold
- No piezo-electric ringing
- Application: Q-switches, pulse picking and EO modulator

Gray track is the induced absorption when irradiated with light having short wavelengths in the VIS or UV spectrum, and often leads to subsequent photochromic damage. Regular flux-grown KTP often suffers from gray track damage attributed to the polarons. Whilst the hydrothermal-grown HGTR KTP exhibits a much stronger gray track resistance in comparison to normal KTP (about 5X-10X the magnitude of KTP).

Shalom EO offers HGTR KTP crystals for electro-optical modulation applications. Besides the superior gray track, our HGTR KTP also boasts a high damage threshold (damage threshold: ≥2GW/cm2 @1064nm, TEM00,10ns,10Hz), excellent thermal/mechanical properties, great chemical stability, which makes them suitable for making electro-optic devices with outstanding overall performances.

Specifications oF Stamdard HGTR-KTP EO Crystals:

Materials	HGTR-KTP crystals	Aperture Range	From 2x2mm to 10x10mm
Coating	AR/AR; R<0.2%@1064nm	Damage Threshold	>600MW/cm^2 @1064nm, 10nS
Wavefront Distortion@1064nm	<Lambda/8	Transmission	>98.5%
Extinction Ratio	>20dB		

HGRT-KTP Properties:

Materials	HGTR-KTP crystals	Dimension Tolerance	(W±0.1mm)x(H±0.1mm)x(L+0.5/-0.1mm)
Size Range	Aperture:~10x10mm; Length: ~15mm	Clear Aperture	central 90% or the diameter
Scattering of Crystals	No visible scattering paths or centers when inspected by a 50mW green Laser	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/8 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤20 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	≤0.25°	Coating	AR/AR@1064nm on both end surfaces
Quality Warranty Period	one year under proper use one year under proper use		

TeO2 Crystals for AO application



- High figure of merit(M2=793 x 10^-18S^3/g)
- Large refractive index (no=2.274, ne=2.430@633nm)
- Large Size Capability
- Broad optical transmission range: 350-5000nm
- Applications: AOM (Acousto-Optic Modulators), AODF (Acousto-Optic Deflectors), AOTF (acousto-optic tunable filters), FCAOM, etc.

Tellurium Dioxide crystal is a colorless, transparent crystal with versatility in the Acousto-Optic and Piezo-Electric realms. The family of TeO2 crystals could be classified into three structure kinds, so far just Gamma TeO2 of the Paratellurite structure could be grown using artificial approaches. The grown TeO2 crystal exhibits prevailing optical, acoustic, and piezoelectrical properties. The impressively high figure of merits of TeO2 crystals contributes to wide optical bandwidth from the Visible spectrum to the Near IR spectrum, and optimized diffraction efficiencies to yield the maximum extinction ratio possible. The Acousto-Optic Modulators made of TeO2 crystals could have a resolution that is several times the magnitude of the AOM made from other AO materials given that the apertures are the same. Other advantages of TeO2 include fast rise time, slow shear wave propagation in the <110> orientation, and moderate driver power requirements.

Shalom EO offers various forms of TeO2 crystals including Teo2 crystal boules or ingots with inspection polishing (2 inch, 3 inch, and 4 inch), TeO2 crystal blanks, laser-grade polished and coated TeO2 crystals. Custom TeO2 crystals are also available upon request.

Operation Modes of TeO2 Crystals:

Operation Mode	Direction		Corresponding Elastic Stiffness Constants (Cij)	Acoustic Velocity (10^5cm/s)
	Propagation	Displacement		
Longitudinal	[100]	-	C11	3.051+/-0.012
Shear	[100]	[010]	C66	3.317+/-0.009
Longitudinal	[001]	-	C33	4.202+/-0.01
Shear	[001]	Random	C44	2.104+/-0.006
Shear	[110]	[110]	(C11-C12)/2	0.616+/-0.003
Shear	[101]	[101]	C	2.101+/-0.006

Note: C={(C11+C33+C44)-[(C11-C33)^2+4(C13+C44)^2]^1/2}/4

Modules or Types:

Hangzhou Shalom EO provides TeO2 crystals in the following specifications:
2 inch, 3 inch, and 4 inch TeO2 crystals boules or ingots with inspection polishing
TeO2 crystals blanks
Laser grade polished and coated TeO2 crystals

Basic Properties of TeO2 Crystals

Chemical Formula	TeO2	Crystal Structure	Tetragonal System, Paratellurite Structure,422 point group
Lattice Parameter	a=0.4810nm c=0.7631nm	Mohs Hardness	4.5
Density	5.99 g/cm3	Melting Point	730°C
Sublimation Point	450°C	Thermal Expansion Coefficients	α11=21x10^-6/°C α22=α11 α33=5.5x10^-6/°C
Thermal Conductivity	30 +/- 10% uW/cm/°C		
Refractive Index	At 632.8nm	no=2.26 ne=1.41	
	At 589nm	no=2.274 ne=2.430	
Transmission Range	350-5000nm	Dielectric Constants (at 20°C)	E11/E0=22.9+/-1.0 E11/E0=24.7+/-1.5
Elastic Constants (at 20°C)	C11	5.57+/-0.13x10^11 dyne/cm^2	
	C12	5.12+/-0.24x10^11 dyne/cm^2	
	C13	2.18+/-0.20x10^11 dyne/cm^2	
	C33	10.58+/-0.24x10^11 dyne/cm^2	
	C44	2.65+/-0.06x10^11 dyne/cm^2	
	C66	6.59+/-0.15x10^11 dyne/cm^2	
	S11	11.5X10^-12 cm^2/dyne	
	S12	-10.48x10^-12 cm^2/dyne	
	S13	-0.21x10^-12 cm^2/dyne	
	S33	1.03x10^-12 cm^2/dyne	
	S44	3.77x10^-12 cm^2/dyne	
	S66	1.52x10^-12 cm^2/dyne	
Temperature Coefficients of the elastic Constants (/°C)	Γ11= -3.0x10^-4 Γ33= -3.0x10^-4 Γ44= -1.3x10^-4 Γ66= --3.3x10^-4	Photo-Elastic Coefficients(at 0.6323μm)	P11 ~0.0074 P12 =+0.187 P31 =+0.095 P13 =+0.340 P30 =+0.240 P44 ~-0.17 P66 =-0.0463

Passive Q-switch Crystals



A Passive Q-switch is a saturable absorber, during the operation process, when it is pumped using laser light, it stores energy and is transformed into a saturated state, its transmission increases which reduces the resonator loss with a fast rate, generating laser pulse. The pulse energy and duration are often fixed values, the increase of pumping power only increases the repetition rate of the pulses.

Q-switch crystals exhibit unique properties that enable efficient control of the laser pulse duration and energy output. Composed of materials with specific optical characteristics, these crystals undergo a rapid change in their optical properties when subjected to an external stimulus, such as an electrical field or light. Q-switch crystals are distinguished by their low saturation fluence (saturation energy per unit area), and when employed with converging beams, they can further diminish the saturation energy (saturation fluence multiplied by beam area)

Hangzhou Shalom EO offers various kinds of passive Q-switch crystal products, including Cr4+:YAG, Co2+:MgAl2O4, and V3+:YAG. While Cr:YAG is popular in the market and supports well the operations of 1μm Nd:YAG lasers, Co:MgAl2O4 (or Co:Spinel) is preferred for Erbium lasers at 1.54μm and V:YAG is an attractive candidate for 1.3μm lasers.

Co2+:MgAl2O4 (Co2+:Spinel) Crystals



- High absorption cross section
- Fit for laser wavelength range 1.2 ~ 1.6μm
- Excellent for 1.54μm Erbium doping lasers
- High contrast Q-switch

Co2+:MgAl2O4 (Co2+:Spinel or Co:MALO) crystals is a new material for passive Q-switching in lasers emitting from 1.2 to 1.6 μm, in particular, for eye-safe 1.54 μm Er:glass laser, but also works at 1.44 μm and 1.34 μm wavelengths. High absorption cross section (3.5 × 10-19cm2) permits Q-switching of Er:glass laser without intracavity focusing both with flash-lamp and diode-laser pumping. Negligible excited-state absorption results in high contrast of Q-switch, i.e. the ratio of initial (small signal) to saturated absorption is higher than 10.

Hangzhou Shalom EO offer the high quality Co:Spinel crystals materials with high optical quality and uniform distribution of Co2+ in laser grade polishing and coatings.

Specifications:

Material	Co2+:MgAl2O4	Orientation	<111>+/-0.5°
Doping Rate of Co2+	0.05-0.3 atm%	Optical Density	0.1-0.9
Optical Density	0.1-0.9	Absorption Coefficient	1.0cm-1-7cm-1
Transmittance	30%-99%	Absorption Section	3.5 x 10-19cm2
Thickness/Diameter Tolerance	+/-0.1mm	Parallelism	10″
Perpendicular	5′	Surface Quality	10/5
Wavefront Distortion	Lambda/8 @ 632nm	Flatness	Lambda/8 @ 632nm
Aperture	>90%	Chamfer	0.1 x 45°
HR Coating	≦ 0.2%(@ 1533nm)	Damage Threshold	>500MW/cm2

Cr4+:YAG Crystals





- Good transmission at 0.8~1.2μm
- Popular for Nd lasers and Yb lasers
- Excellent chemical, thermal, and mechanical properties
- High damage threshold
- Repetition frequency up to 10kHz
- Stocked and custom crystals available

Chromium Doped Yttrium Aluminum Garnet (Cr4+:YAG) Crystal is an excellent E-O material for passive Q-switching diode pumped or lamp-pumped Nd:YAG, Nd:YLF, Nd:YVO4 and other Nd (or Yb) doped lasers at 0.8~1.2μm. With the advantages of chemical stability, durability, UV resistance, good thermal conductivity, high damage threshold (>500 MW/cm2), and easy operation, Cr4+:YAG is edging out traditional materials, such as LiF, organic Dye, and color centers. Cr:YAG is simple to use and does not need any external driving component, which makes it advantageous for compact construction. Cr:YAG crystals operate well at the repetition rate up to 10kHz.

Hangzhou Shalom EO offers high-precision polished Cr:YAG crystals with a maximum aperture of 14x14mm, a maximum length of 12mm, and a broad initial transmission range of 5% to 95%. Both stocked and custom crystals are available.

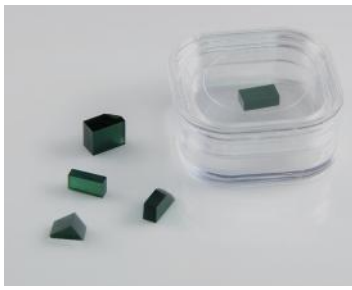
Specifications:

Surface Area	2×2 mm2~ 14×14mm2	Length	0.1mm ~ 12mm
Doping Concentration	0.03mol% ~ 0.65mol%	Initial Transmission	5% ~ 95%
Flatness	< λ/10 @633nm	Wavefront Distortion	< λ/6 @633nm
Parallelism	< 30"	Surface Quality	10/5 S/D (MIL-O-13830A)
Wavefront Distortion	Lambda/8 @ 632nm		

Physical and Optical Properties:

Chemical Formula	Cr4+:Y3A15O12	Crystal Structure	Cubic Garnet
Density	4.56g/cm3	Hardness	8.5 Mohs
Damage Threshold	> 500 MW/cm2	Regractive Index	1.82 @ 1064nm

V3+:YAG Crystals



- Fit for laser wavelength range 1.06 ~ 1.44μm
- Excellent for 1.3μm Nd lasers
- UV resistant
- Good thermal conductivity
- High damage threshold

V3+:YAG crystals are a novel material for saturable absorber passive Q-switching in lasers emitting from 1.06 to 1.44 μm, in particular, for 1.3 μm Nd-lasers. Excellent ground state absorption (GSA) cross section of 7x10-18 cm2 near 1.3μm and negligible excited state absorption (ESA) permits Q-switching of 1.3μm and 1.44μm Nd-lasers without intracavity focusing both with flash-lamp and diode-laser pumping. V:YAG has good chemical stability and thermal conductivity, it is UV resistant and has a high damage threshold.

Hangzhou Shalom EO offers high-quality V3+:YAG with laser-grade polishing and coatings.

Specifications:

Material	V3+:YAG Crystals	Orientation	<100> <+/-0.5°
Optical Density	0.1-0.8	Absorption Coefficient	1.0cm-1 - 7.0cm-1
Transmittance	30%-97%	Absorption Cross Section	2.8x10-18cm2(at 1.34μm)
Thickness/Diameter Tolerance	+/-0.1mm	Parallelism	10″
Perpendicular	5′	Surface Quality	10/5 S/D
Wavefront Distortion	Lambda/8 @ 632nm	Flatness	Lambda/8 @ 632nm
Aperture	>90%	Chamfer	<0.2 x 45°
HR Coating	<= 0.2% (@ 1340nm)	Damage Threshold	>500MW/cm2

Birefringent Crystals



Birefringent crystals are crystals that exhibit birefringence, which is the dependence of the refractive indices that the incident light encounters on the polarization direction of transmitted light. When light enters a birefringent crystal at an arbitrary angle (i.e. the light does propagate along the optical axis), the incident light will be split into two distinct beams with different speeds. The birefringence in these crystals is a result of their different refractive indices along different crystallographic axes, and the difference arises from anisotropic crystal structures, and in most cases, non-cubic structures. This intriguing phenomenon makes birefringent crystals invaluable in various optical applications, offering a platform for manipulating and controlling light, and enabling applications such as polarization control, wavelength selection, and phase modulation. Birefringent crystals are the vital material for the fabrication of polarizing optics such as waveplates or retarders, polarizers, and prisms, where their ability to alter the polarization and phase of light is harnessed for precise optical modulation.
Hangzhou Shalom EO offers a diverse range of birefringent crystals, including YVO4, LiNbO3, Quartz, Calcite, MgF2, and alpha-BBO crystals. The crystals ingot, blanks, and polished and coated crystals are also available.

Alpha-BBO Crystals



- High UV transmittance and Large birefringence
- High damage threshold
- Stable physical and mechanical properties
- Low hygroscopic susceptibility
- Crystal ingots, polished optics available

Alpha-BBO Crystal is the high-temperature phase of BaB2O4 crystal. Alpha BBO is a negative uniaxial crystal with the recognizable merit of large birefringence over a wide spectral region of 189-3500nm. Alpha BBO crystals are broadly used for fabrication of polarizers, polarizing beam displacers, phase retarders, birefringent plates, and time delay compensators. Alpha BBO crystal finds excellence in particular for high-power and UV applications attributing to its exceptional transmittance in the UV region and superior physical properties.

Shalom EO offers Alpha-BBO crystal ingots, polished optics made using alpha-bbo are also available. Our alpha bbo birefringent crystals feature high optical transparency spanning the UV to IR spectrum, surpassing optical homogeneity, low hygroscopicity, and high damage threshold.

Specifications:

Material	α-BBO	Size(mm)	1-40mm
Surface Quality	10/5 S/D	Optical Axis Orientation	<6 arc min
Parallelism	10 arc sec	Flatness	λ/4@633nm
Clear Aperture	>90% of full aperture	Coating	AR coating
Mount	Upon customer's requests		

Basic Properties:

Transparency Range	190-3500nm	Density	3.85g/cm3
Hygroscopic Susceptibility	low	Mohs Hardness	4.5
Damage Threshold	>1GW/cm2	Sellmeler Equation(λ in μm)	no2 = 2.7471+0.01878/(λ2 -0.01822)-0.01354λ2 ne2 = 2.37153+0.01224/(λ2 -0.01667)-0.01516λ2

MgF2 Crystals



- Broad transparent spectrum: 0.11～7.5μm
- High UV transmission and large birefringence
- Superior chemical stability
- High resistance to mechanical and thermal shock
- Used for optical prisms, waveplates, lenses, and windows
- Crystal ingot, blanks, polished and coated components available

Magnesium Fluoride (MgF2) single crystal belongs to the tetragonal system, is a positive uniaxial crystal with a wide transmission spectrum from Deep UV (DUV) to Long Wavelength Infrared (LWIR), which is 110nm to 7500nm, and in particular outstanding optical transmittance in the Vacuum UV (VUV), which is >80% transmittance at 170 nm. MgF2 crystals have a high resistance to thermal and mechanical shocks and optical radiation, and it exhibit excellent chemical stability with immunity to corrosion and deliquescence. Due to its excellent DUV transmission, MgF2 crystals have become the most suitable materials for 193nm ArF and 248nm KrF excimer lasers. Furthermore, MgF2 has a large birefringence, which makes it suitable for the fabrication of waveplates. MgF2 crystals can be used in MWIR and LWIR thermal imaging applications, and fiber communication, and it is also harnessed for thin film growth.

Hangzhou Shalom EO offers MgF2 crystal ingots, blanks, and polished/coated optics made using MgF2. Optical windows, polarizers, prisms, lenses, wedged windows, and waveplates made from MgF2 single crystals with high laser grade precision are also available, the MgF2 optical components are excellent for integration into 193nm ArF excimer lasers and other Ultra-Violet (UV) lasers.

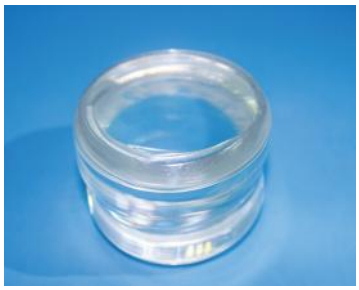
Specifications:

Material	MgF2 Crystal	Wavelength	110~8500nm
Size	0.1mm-100mm	Surface Quality	20/10 S/D
Optical Axis Orientation	<6 arc min	Parallelism	<1 arc sec
Flatness	λ/10 @ 633nm	Clear Aperture	>95% of full aperture

Basic Properties:

Transparency Range	0.11~7.5μm	Molecular Weight	62.32
Class/Structure	Tetragonal, can cleave on C-axis	Density	3.177g/cm3
Melting Point	1255℃	Hardness	Knoop 415 kg/mm2
Specific Heat Capacity, cal/(g K)	0.24 @ 298K 0.362@1700K	Thermal Conductivity	0.3 W/(m K) at 27 °C
Thermal Expansion	13.7and 8.48 x 10-6e/ °C	Refractive Index	N0=1.3836 Ne=1.3957 @ 0.405μm
Reflection Loss	11.2% @ 0.12 μm (2 surfaces)	Dielectric Constant	4.87 parallel and 5.45 perpendicular
Restrahlen Peak	20μm	dN/dT	+2.3 and +1.7 x 10-6e/ °C at 0.4μm
Elastic Coefficients	C11=140.2 C12=89.5 C44=56.8 C33=204.7 C13=62.9 C66=95.7	Young's Modulus (E)	138.5 GPa
Shear Modulus (G)	54.66 GPa	Bulk Modulus (K)	101.32 GPa
Apparent Elastic Limit	49.64 MPa	Poisson Ratio	0.276
Solubility	<0.0002 g/100g water @ 0 °C		

LiNbO3 Crystals



- Wide transmission wavelength range of 350-5200nm
- high damage threshold and great mechanical strength
- Ideal for manufacturing isolators, circulators, beam displacers, and polarizing optics
- Two precision grade options: standard/high-precision
- Crystal ingots, blanks, and polished substrates available

LiNbO3 (Lithium niobate, LN) crystal is a negative uniaxial crystal with a wide transmission spectrum from 350nm to 5200nm, from visible to near-infrared wavelengths. Belonging to the trigonal crystal system, LiNbO3 crystals exhibit a unique combination of optical, electrical, and mechanical characteristics, making them indispensable in various technological applications and one of the most versatile crystal materials. LiNbO3 crystals have excellent piezoelectric, electro-optic, and nonlinear optical properties.

One of the most notable features of LiNbO3 crystals is their inherent birefringence, stemming from the non-centrosymmetric crystal structure. This characteristic allows for the splitting of incident light into two orthogonal polarization states, enabling a plethora of optical functionalities. Their robustness, low optical absorption, low production cost and high damage threshold render them attractive candidates for manufacturing polarizing optics. Birefringent LiNbO3 crystals also find widespread usage in the realm of fiber communication for applications such as isolators, circulators, beam displacers.

Shalom EO offers various forms of LiNbO3 Crystals including LiNbO3 crystal ingots, LiNbO3 crystal blanks, and LiNbO3 polished substrates. High-precision polishing and AR/P-coatings can be arranged. LiNbO3 crystals and MgO: LiNbO3 crystals for EO applications and MgO:PPLN Crystals are also available in Shalom EO.

Specifications:

Material	Standard	High Precision
Size	~20×20 mm2	
Thickness	0.01~25 mm	
Dimension Tolerance	+/-0.1mm	+/-0.01mm
Wavefront Distortion	λ/4	λ/6
Surface Quality	20/10 S/D	10/5 S/D
Orientation	+/-0.3°	+/-0.1°
Parallelism	<20 arc sec	<10 arc sec
Flatness	λ/4	λ/6
Coating	AR Coating or P Coating	

Basic Properties:

Transparency Range	420~5200nm	Optical Homogeneity	~ 5 x 10-5 /cm
Refractive indices@1064nm	ne=2.146, no=2.220@1300nm ne=2.156, no=2.232@1064nm ne=2.203, no=2.286@632.8nm	NLO Coefficients	d33 = 86 x d36 (KDP) d31 =11.6 x d36 (KDP) d22 = 5.6 x d36 (KDP)
Effective NLO Coefficients	γT33 = 32 pm/V, γS33 = 31 pm/V γT31 =10 pm/V, γS31=8.6 pm/V γT22 = 6.8 pm/V, γS22= 3.4 pm/V	Half-Wave Voltage, DC Electrical field // z, light ⊥ z: Electrical field // x or y, light // z:	 3.03 KV 4.02 KV
Damage Threshold	100 MW/cm2 (10ns, 1064nm)		

Quartz Crystals



- Broad transparent spectral range from 0.2μm to 3.5μm
- Excellent chemical, mechanical, and thermal properties
- Good refractive properties
- Applications: waveplates and polarization manipulation
- Maximum size: 130x130mm in square and 150mm as diameter

Optical grade quartz crystals have a broad transparent range of 0.2μm to 3.5μm, with high internal crystalline perfection and excellent optical homogeneity. Quartz crystals exhibit exceptional mechanical and thermal properties with low thermal expansion avoiding deformation. Furthermore, the high machinability of quartz allows for convenient engineering and adjusting of the dimensions and the designs of optics, its resistance to chemical corrosion and deliquescence attribute to superb durability. Quartz also stands out for its exceptional refractive characteristic, which makes it suitable for the manufacturing of waveplates and polarizing optics.

Hangzhou Shalom EO offers optical grade quartz crystals, quartz crystal ingots, blanks, polished wafers, and substrates. The maximum size is 130x130mm square or 150mm as diameter.

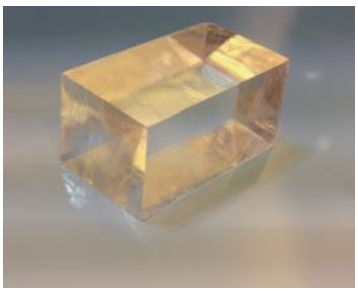
Specifications:

Material	Quartz Crystal	Wavelength	150~4000nm
Size	0.1mm-100mm	Surface Quality	10/5 S/D
Optical Axis Orientation	<6 arc min	Parallelism	<1 arc sec
Flatness	λ/10 @ 633nm	Clear Aperture	>95% of full aperture
Coating	Upon Customer's Specification		

Basic Properties:

Crystal Class	Hexagonal	Molecular Weight	60.06
Density	2.635-2.660 g/cm3@ 289 K	Dielectric Constant	for 3x107 Hz @295 K 35 microns
Parallel	4.27	Perpendicular	4.34
Reflection Loss	8.2 % for two surfaces @ 2 mm	Melting Temperature	1740 K
Specific Heat	0.17 cal/(g K)@ 273 K	Knoop Hardness	741 kg/mm2
Transmission Range	0.4 - 4.5μm	Debye Temperature	470 K
Thermal Conductivity	Parallel/Perpendicular	720/370 W/(m K) @20K	
	Parallel/Perpendicular	20/10W/(m K) @194K	
	Parallel/Perpendicular	10.7/6.2W/(m K) @323K	
Parallel	97.2 GPa	Perpendicular	76.5 GPa
Bulk Modulus	36.4 GPa	Shear Modulus	31.14 GPa
Solubility in Water	None	Bandgap	8.4

Optical Calcite Crystals



- Broad transparent spectral range from 0.2μm to 2.5μm
- High birefringence
- Soft and prone to scratches
- Applications: Polarizers, Beam divergent elements, Laser gate

Optical calcite crystals are a kind of natural mineral, single calcite crystal is a negative uniaxial crystal with a large birefringence over the wide transmission spectral range from 200nm to 2500nm. Although calcite is a quite soft crystal that is susceptible to scratch, it is still an excellent material for manufacturing polarizing prisms, beam-divergent elements, laser gates, and other optical devices.

Hangzhou Shalom EO provides various forms and dimensions of optical-grade calcite crystals. We also offer prisms, paired prisms, and polarizers made from calcite crystals: Glan Thompson Prisms, Glan Taylor Prisms, and Glan Laser Prisms, Group Velocity Delay Compensators in femtosecond lasers.

Specifications:

Material	Calcite Crystals	Wavelength	350-2300nm
Size (mm)	0.2-60mm	Flatness	λ/8
Surface Quality	20/10 S/D	Clear Aperture	> 95% of full aperture
Parallelism	<10 arc sec	Optical Axis Orientation	< 6 arc min
Coating	Upon customer's request		

Basic Properties:

Density	2.7 g/cm3	Melting Point	730℃
Mohs Hardness	3	Transparency Range	350-2300nm
Thermal Expansion Coefficient (/℃)	aa=24.39×10-6/K ac=5.68×10-6/K	Refractive Index	no = 2.260 n3 = 2.142
Damage Threshold	>1GW/cm2	Sellmeier Equation (λ in μm)	no2=2.69705 + 0.0192064/(λ2-0.01820) - 0.0151624λ2 ne2=2.18438 + 0.0087309/(λ2-0.01018) - 0.0024411λ2

YVO4 Crystals



- Broad transparent spectral range from 0.4μm to 5μm
- Large birefringence
- Excellent mechanical and physical properties
- Applications: Fiber optical isolators and circulators, Beam displacer, Glan polarizers, other polarizing optics

Yttrium Vanadate (YVO4) crystals, grown using the Czochralski method, are positive uniaxial crystals known for their exceptional mechanical robustness, superior chemical and optical properties, and excellent thermal stability. With a broad transparent range spanning from 400nm to 5000nm and significant birefringence, YVO4 crystals are suitable for manufacturing optical polarizing components. Serving as excellent synthetic substitutes for Calcite ($CaCO_3$) and Rutile (TiO_2) in various applications, the crystals find widespread use in fiber optic isolators and circulators, beam displacers, Glan polarizers, and other polarizing optics.

Hangzhou Shalom EO offers various forms and dimensions of YVO4 crystals. We also offer prisms, paired prisms, and polarizers made from YVO4 crystals: including Glan Taylor Polarizers, Glan Laser Polarizers, and Wollaston Polarizers.

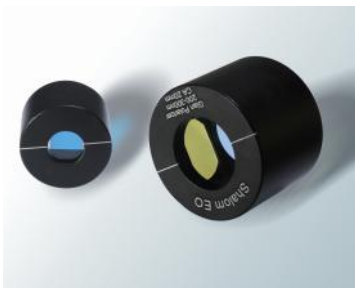
Specifications:

Material	YVO4 Crystal	Wavelength	400~5000nm
Size	0.1mm-30mm	Surface Quality	20/10 S/D
Optical Axis Orientation	<6 arc min	Parallelism	<10 arc sec
Flatness	λ/8 @ 633nm	Clear Aperture	>95% of full aperture
Coating	Upon Customer's Specification		

Basic Properties:

Transparency Range	400~5000nm	Density	4.22g/cm3
Hygroscopic Susceptibility	N/A	Mohs Hardness	5
Thermal Expansion Coefficients (/°C)	aa=4.4X10-6 /K ac=11.4X10-6 /K	Parallelism	<10 arc sec
Refractive Indices	No=2.01768, Ne=2.25081,532nm No=1.95714, Ne=2.16498,1064nm	Sellmeier Equation (λ in μm)	no2 =3.77834+0.069736/(λ2-0.04724)-0.0108133λ2 ne2 =4.5909+0.110534/(λ2-0.04813)-0.0122676 λ2

Polarization Optics



Polarization Optics are designed to change the polarization state of incident light. The functions of polarization optics are diverse, including selecting a polarization component, obtaining two symmetrical polarization components, rotating the plane of linear polarization, etc.

Hangzhou Shalom EO offers a large selection of Off-the-shelf and Custom Polarization Optics, comprising: Glan Laser Polarizers, Glan Taylor Polarizers, Glan Thompson Polarizers, Wollaston Prisms, Rochon Prisms, Polarization Plane Roatators, Achromatic Depolarizers.

Glan Polarizers, Wollaston Polarizers, and Rochon Polarizers all pertain to the crystalline birefringent polarizer kind, which operate based on the birefringent nature of the crystals.

A Glan Polarizer consists of two prisms with their orientations of the optical axes being equivalent and parallel to the plane of reflection. The acute angles of the constituent prisms are contrived upon deliberation so that when the ordinary component (s-polarization) and the extraordinary (p-polarization) component enter the polarizer, the o component is rejected and the e component is transmitted. There is subtle discrimination among Glan Laser, Glan Taylor, and Glan Thompson Polarizers. A Glan laser polarizer has an air-spaced construction and escape ports, contributing to a high laser-induced damage threshold, hence could endure higher laser power; a Glan Taylor polarizer has no escape port, so it is suggested for low and medium power applications; a Glan Thompson polarizer has a substantial length-to-width ratio and therefore has a large acceptance angle, however, it is of cemented structure, so it is confined to low power usage.

A Wollaston Prism composes two right-angle prisms with their optical axes aligned in orthogonal directions so that it switches the o component in the first prism into the e component and the e component in the first prism into the o component in the second prism. In the end, both the e and o light experience a symmetrical angular deviation.

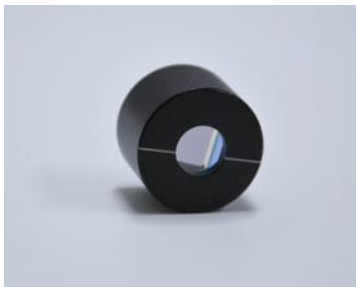
A Rochon Prism works in a quite similar manner to the Wollaston prism, except for the part that in the case of Rochon Prisms the ordinary light experiences no deviation.

A Polarization Plane Rotator is an excellent alternative to half-waveplates made from crystalline quartz. It alters light of linear polarization at a specific angle with independence of rotation around its optical axis.

An Achromatic Depolarizer consists of two wedged prisms made of birefringent materials with their fast axes aligned at 45 degrees to each other, which are utilized to randomize input linear polarization.

Hangzhou Shalom EO is an industrial-leading supplier and manufacturer of Polarization Optics. We provide polarization optics made of various substrate materials including Calcite, Alpha-BBO, YVO4, MgF2, and Quartz, with their transmission spectrum spanning from UV, VIS, to IR. Anti-reflection coatings and protective coatings are available both as standard and custom versions. Unique designs of the construction of the polarization optics are accessible, including air-gap, cement, black glass, and escape ports.

Glan Laser Polarizers



- High extinction ratio 20000:1 or 200000:1
- Substrate materials: Calcite, Alpha-BBO, and YVO4
- Air-spaced structures and escape ports ideal for high power laser
- Circular or rectangular black anodized aluminum housing with black glass and no/one/two escape ports are available
- Various coating options: protective coatings, broadband coatings ranging from UV, VIS, to MWIR

A Glan Laser Polarizer is a polarizing optic consisting of two identical right-angle prisms made from birefringent crystalline materials. Like most polarizers, the function of a Glan Polarizer is to screen certain polarization components of light.

The working principles of Glan Laser Polarizer or Glan Polarizer are identical: exploiting the different refractive indices between the o component and the e component stemming from the birefringent nature of crystal and the critical angle to realize the filtering of polarization components.

The prisms that compose the Glan laser polarizer are positioned on purpose so that their optic axis orientations, which are parallel to the plane of reflection and perpendicular to the proceeding beam, are the same. Take the example of a calcite Glan laser polarizer, first, when a light beam strikes at 90° to one of the terminals of the Glan laser polarizer, because of calcite's birefringent properties, the light beam divides into two components, the ordinary component (the s polarization) and the extraordinary components (the p polarization). However, since the light beam enters along the normal of the terminal face, both the ordinary component and the extraordinary components will not deviate at the air-to-calcite interface but will encounter refraction at the conjunction where the two prisms are assembled.

Assume their angle of incidence at the interface of the two constituent prism equals the angle θ, angle θ is equivalent to the angle between the oblique face and the right-angle face of the prism. θ becoming the incident angle implies that for the o component, the incident angle is greater than the critical angle, which triggers the total internal reflection (TIR). The ordinary component will be reflected and rejected, Whilst, for the extraordinary component, the incident angle is smaller than the critical angle, permitting it to pass through and emit a beam of linear polarization. The transmitted extraordinary light does not deviate from its initial direction and is of high linear polarization purity.

Shalom EO's Glan Laser Polarizers are constructed with an air-spaced architecture, with the adhesive-free, air-gap structure, the endurance to high power is raised to greater than but not limited to 500MW/cm2@1064nm, 20ns, 20Hz. We select the materials that pass a test of laser scattering sensitivities and persist in high precision fabrication and inspection, hence an exceptional extinction ratio of 20000:1 to 200000:1 could be obtained. The black anodized aluminum housing could either be rectangular or circular, black glass to absorb the dumped light is accessible. No, one or two escape ports could be configured to prevent detrimental power absorption or even allow the utilization of the rejected ordinary component for extra power capacities.

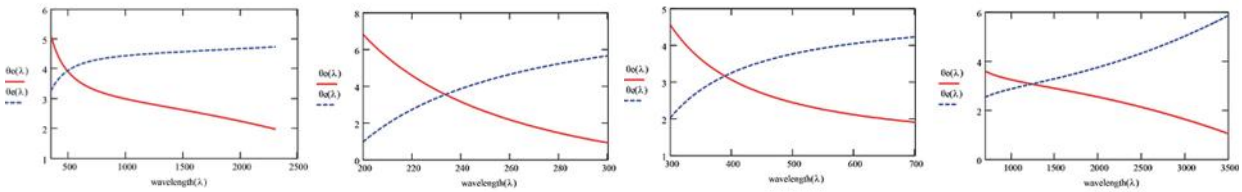
The Glan Laser Polarizers are available in both stocked and custom versions, for standard versions, we offer three substrate materials: Calcite, Alpha-BBO, and YVO4, with broadband coatings of transmission spectrum ranging from UV, VIS, to MWIR: Calcite:350-2300nm; Alpha-BBO:200-300nm, 300-700nm; YVO4:500-4000nm. Protective coatings are also accessible. Standardized aperture sizes are accessible in stock, including:φ6mm, φ10mm, φ12.7mm, φ15mm, φ 20mm. Other sizes are available upon request. Besides, Shalom EO also offers a full portfolio of Glan polarizers, including Glan Taylor Polarizers, which are appropriate for low and medium-power lasers, and Glan Thompson Polarizers which feature large acceptance angles, if you are interested, you might click on the bold text to learn more.

Common Specifications:

Item	Calcite GLP	a-BBO GLP	YVO4 GLP
Wavelength Range	350-2000nm	190-3500nm	500-4000nm
Extinction Ratio	<5x10-5	<5x10-6	<5x10-6
Surface Quality	20/10 S/D		
Beam Deviation	< 3 arc minutes		
Wavefront Distortion	<λ/4@633nm		
Damage Threshold	>500MW/cm2@1064nm, 20ns, 20Hz		
Coating	P Coating Or AR Coating		
Mount	Black Anodized Aluminium		

Curves:

Field of View (FOV) against Wavelength



Product List of Glan Laser Polarizers

Code	Material	Wavelength	Aperture	Extinction Ratio	Mount	Unit Price
20701-001	Alpha-BBO	200-300nm	ϕ6mm	<5x10-6	ϕ15x20mm	$230.0
20701-002	Alpha-BBO	200-300nm	ϕ10mm	<5x10-6	ϕ25.4x31mm	$425.0
20701-003	Alpha-BBO	200-300nm	ϕ12.7mm	<5x10-6	ϕ25.4x31.5mm	$515.0
20701-004	Alpha-BBO	200-300nm	ϕ15mm	<5x10-6	ϕ30x38mm	$685.0
20701-005	Alpha-BBO	200-300nm	ϕ20mm	<5x10-6	ϕ38x48mm	$1215.0
20701-006	Alpha-BBO	300-700nm	ϕ6mm	<5x10-6	ϕ15x20mm	$230.0
20701-007	Alpha-BBO	300-700nm	ϕ10mm	<5x10-6	ϕ25.4x26mm	$425.0
20701-008	Alpha-BBO	300-700nm	ϕ12.7mm	<5x10-6	ϕ25.4x27mm	$515.0
20701-009	Alpha-BBO	300-700nm	ϕ15mm	<5x10-6	ϕ30x33mm	$685.0
20701-010	Alpha-BBO	300-700nm	ϕ20mm	<5x10-6	ϕ38x43mm	$1215.0
20701-011	Alpha-BBO	700-3500nm	ϕ6mm	<5x10-6	ϕ15x20mm	$230.0
20701-012	Alpha-BBO	700-3500nm	ϕ10mm	<5x10-6	ϕ25.4x26mm	$425.0
20701-013	Alpha-BBO	700-3500nm	ϕ12.7mm	<5x10-6	ϕ25.4x27mm	$515.0
20701-014	Alpha-BBO	700-3500nm	ϕ15mm	<5x10-6	ϕ30x33mm	$685.0
20701-015	Alpha-BBO	700-3500nm	ϕ20mm	<5x10-6	ϕ38x43mm	$1215.0
20701-016	Calcite	350-2300nm	ϕ6mm	<5x10-5	ϕ15x20mm	$170.0
20701-017	Calcite	350-2300nm	ϕ10mm	<5x10-5	ϕ25.4x26mm	$275.0
20701-018	Calcite	350-2300nm	ϕ12.7mm	<5x10-5	ϕ25.4x27mm	$365.0
20701-019	Calcite	350-2300nm	ϕ15mm	<5x10-5	ϕ30x33mm	$545.0
20701-020	Calcite	350-2300nm	ϕ20mm	<5x10-5	ϕ38x43mm	$985.0
20701-021	YVO4	500-4000nm	ϕ6mm	<5x10-6	ϕ15x15mm	$275.0
20701-022	YVO4	500-4000nm	ϕ10mm	<5x10-6	ϕ25.4x19mm	$545.0
20701-023	YVO4	500-4000nm	ϕ15mm	<5x10-6	ϕ30x23mm	$1165.0

Glan Taylor Polarizers



- Extinction ratio: 20000:1 and 200000:1
- Air-spaced construction
- Three kinds of substrate materials: Calcite, Alpha-BBO, YVO4
- Coating options: P-coatings and Broadband AR coatings
- Suitable for low and medium power applications
- Rectangular or circular black anodized aluminum housing

A Glan Taylor Polarizer is a polarization optic composing two wedge prisms with their slanted sides assembled together with air-gap construction. To a great extent, Glan Taylor polarizers are similar to Glan laser polarizers. Glan Taylor polarizers also leverage the manipulation of angles and refraction indices to realize the screening of polarization components. The orientations of the optical axes of the first prism and the second prism are equivalent, when an incident light hit 90 degrees on one of the end faces of the polarizer, the polarizer separates the light beam into two orthogonal polarization: the s polarization (i.e. the ordinary component), the p polarization (i.e. the extraordinary polarization). The angles of the constituent prisms are contrived upon deliberation, and their optical axes are parallel to the plane of the entrance, so that when the o component and the e component enter the polarizer, the o component experiences total internal reflection (TIR) at the interface between two prisms, whilst the e component keep propagating, since the incident angle at the interface is close to Brewster's angle, a large proportion of extraordinary light is transmitted.

Hangzhou Shalom EO offers Stocked and Custom Glan Taylor Polarizers. Each polarizer consists of two prisms joined utilizing an air-spaced design, with the black anodized aluminum housing available in circular or rectangular forms. It is worth noting that The major difference between Glan Taylor polarizer and a Glan laser polarizer is that a Glan Taylor polarizer does not have an escape port dug on its housing, and therefore is appropriate for low and medium power lasers, but not suggested for high-power applications.

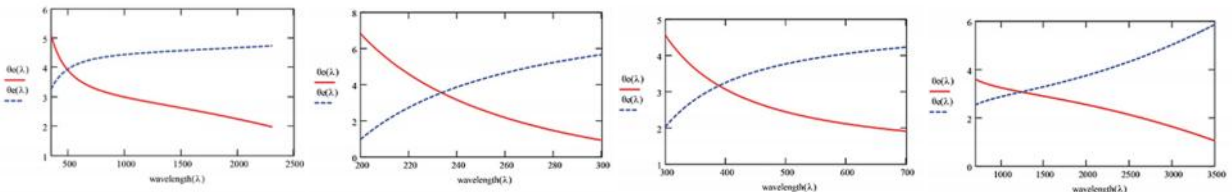
Three kinds of substrate materials are available: Calcite, Alpha-BBO, and YVO4. The maximum extinction ratio is a staggering 200000:1. Miscellaneous coating options including protective coating (P-coating), and broadband AR coating with transmission spectral range spanning from ultraviolet, visible, to infrared are procurable. Standardized aperture sizes are accessible in stock, including:φ6mm, φ10mm, φ12.7mm, φ15mm, and φ20mm. Other sizes are available upon requests.

Common Specifications:

Item	Calcite	a-BBO	YVO4
Wavelength Range	350-2000nm	190-3500nm	500-4000nm
Extinction Ratio	<5x10-5	<5x10-6	<5x10-6
Surface Quality	20/10 S/D		
Beam Deviation	< 3 arc minutes		
Wavefront Distortion	<λ/4@633nm		
Damage Threshold	>200MW/cm2@1064nm, 20ns, 20Hz		
Coating	P Coating Or AR Coating		
Mount	Black Anodized Aluminium		

Curves:

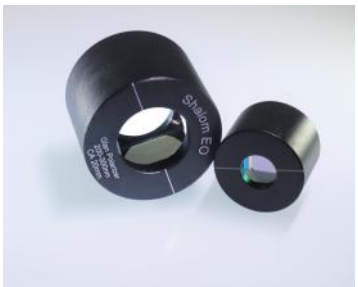
Field of View (FOV) against Wavelength



Product List of Glan Taylor Polarizers

Code	Material	Wavelength	Aperture	Extinction Ratio	Mount	Unit Price
20702-001	Alpha-BBO	200-300nm	ϕ6mm	<5x10-6	ϕ15x15mm	$200
20702-002	Alpha-BBO	200-300nm	ϕ10mm	<5x10-6	ϕ25.4x19mm	$355
20702-003	Alpha-BBO	200-300nm	ϕ12.7mm	<5x10-6	ϕ25.4x21mm	$445
20702-004	Alpha-BBO	200-300nm	ϕ15mm	<5x10-6	ϕ30x23mm	$445
20702-005	Alpha-BBO	200-300nm	ϕ20mm	<5x10-6	ϕ38x29mm	$1125
20702-006	Alpha-BBO	300-700nm	ϕ6mm	<5x10-6	ϕ15x15mm	$200
20702-007	Alpha-BBO	300-700nm	ϕ10mm	<5x10-6	ϕ25.4x19mm	$355
20702-008	Alpha-BBO	300-700nm	ϕ12.7mm	<5x10-6	ϕ25.4x21mm	$445
20702-009	Alpha-BBO	300-700nm	ϕ15mm	<5x10-6	ϕ30x23mm	$540
20702-010	Alpha-BBO	300-700nm	ϕ20mm	<5x10-6	ϕ38x29mm	$1125
20702-011	Alpha-BBO	700-3500nm	ϕ6mm	<5x10-6	ϕ15x15mm	$200
20702-012	Alpha-BBO	700-3500nm	ϕ10mm	<5x10-6	ϕ25.4x19mm	$355
20702-013	Alpha-BBO	700-3500nm	ϕ12.7mm	<5x10-6	ϕ25.4x21mm	$445
20702-014	Alpha-BBO	700-3500nm	ϕ15mm	<5x10-6	ϕ30x23mm	$540
20702-015	Alpha-BBO	700-3500nm	ϕ20mm	<5x10-6	ϕ38x29mm	$1125
20702-016	Calcite	350-2300nm	ϕ6mm	<5x10-5	ϕ15x15mm	$140
20702-017	Calcite	350-2300nm	ϕ10mm	<5x10-5	ϕ25.4x19mm	$245
20702-018	Calcite	350-2300nm	ϕ12.7mm	<5x10-5	ϕ25.4x21mm	$335
20702-019	Calcite	350-2300nm	ϕ15mm	<5x10-5	ϕ30x23mm	$495
20702-020	Calcite	350-2300nm	ϕ20mm	<5x10-5	ϕ38x29mm	$770
20702-021	YVO4	500-4000nm	ϕ6mm	<5x10-6	ϕ15x15mm	$230
20702-022	YVO4	500-4000nm	ϕ10mm	<5x10-6	ϕ25.4x19mm	$430
20702-023	YVO4	500-4000nm	ϕ12.7mm	<5x10-6	ϕ25.4x21mm	$630
20702-024	YVO4	500-4000nm	□15mm	<5x10-6	□30x23mm	$925

Glan Thompson Polarizers



- Large acceptance angle recommended for diverged or converged beam
- High polarization purity 20000:1 or 200000:1
- Cemented structure preferred for low-power applications
- Two substrate materials: Calcite, Alpha-BBO
- Coating Options: P-coatings and broadband AR coatings with transmission spectrum spanning from UV to IR

A Glan Thompson Polarizer is a polarization optic consisting of two right-angle prisms with their hypotenuse cemented together to form a rectangular element of large length-to-width ratio. The operation principle of a Glan Thompson polarizer is alike to its two cousins: Glan laser polarizer and Glan Taylor polarizers.

The prisms have the same optical axis orientation as one another, which is perpendicular to the plane of reflection. As light is split up into two orthogonal polarization due to the birefringent character of the polarizer material, the angle of the prisms is designed so that the s polarization (i.e. the ordinary component) encounters a higher refractive index and is blocked off of the polarizer, while the virtually all of the p polarization (i.e. the extraordinary component) experience no reflection and is allowed to exit. Since the ratio of length-to-width of the rectangular polarizer is quite substantial, which means the interior angle of the prims is quite acute, this contributes to the large acceptance angle of Glan Thompson Polarizers.

Therefore, with the capabilities of coping with a wide field of view, Glan Thomson Polarizer excels in working with diverging and converging light sources. However, the implementation of adhesive as the bonding material limited its usage in high-power applications since the cement drastically reduces the thermal endurance of Glan Thompson polarizers.

Hangzhou Shalom EO offers both Off-the-shelf and Custom Glan Thompson Polarizers. The polarizers compose two prisms cemented together and mounted in black anodized aluminum. Two substrate materials are available Alpha-BBO and Calcite, with Alpha-BBO covering the transmission spectrum of 190-3500nm, Calcite 350-2000nm. Coating options including protective coatings and broadband coatings are both accessible.

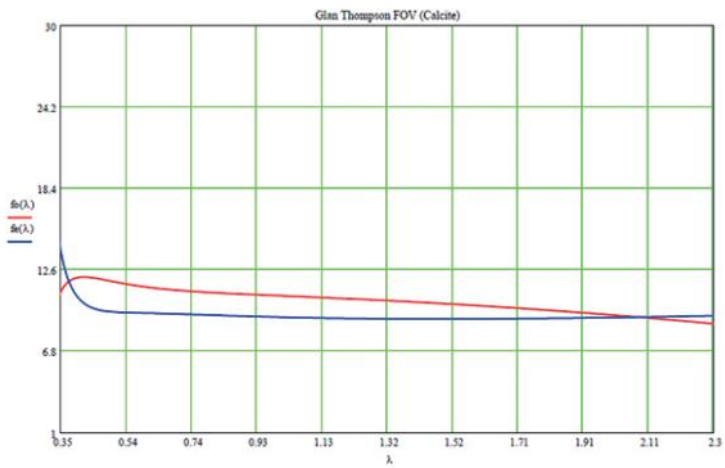
Our Glan Thompson Polarizer features high polarization purities of 20000:1 or 20000:1, wide acceptance angles, and various selections of dimensions. Standardized aperture sizes are accessible in stock, including:φ6mm, φ10mm, φ12.7mm, φ15mm. Other sizes are available upon request.

Common Specifications:

Item	Calcite	Alpha-BBO
Wavelength Range	350-2000nm	200-900nm
Extinction Ratio	<5x10-5	<5x10-6
Surface Quality	20/10 S/D	
Beam Deviation	< 3 arc minutes	
Wavefront Distortion	<λ/4@633nm	
Damage Threshold	>100MW/cm2@1064nm, 20ns, 20Hz	
Coating	P Coating Or AR Coating	
Mount	Black Anodized Aluminium	

Curves:

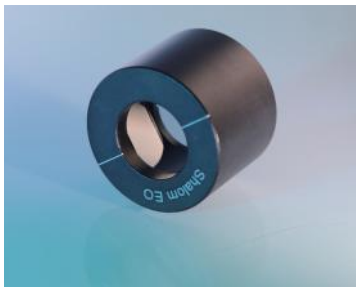
The curves below shows the Field of View (FOV) against Wavelength of a calcite Glan Thompson polarizers.



Product List of Glan Thompson Polarizers

Code	Material	Wavelength	Aperture	Extinction Ratio	Acceptance Angle	Mount	Unit Price
20703-001	Alpha-BBO	200-900nm	ϕ6mm	<5x10-6	>15°	ϕ15x18mm	$370
20703-002	Alpha-BBO	200-900nm	ϕ10mm	<5x10-6	>15°	ϕ25.4x24.5mm	$600
20703-003	Alpha-BBO	200-900nm	ϕ12.7mm	<5x10-6	>15°	ϕ25.4x29mm	$1045
20703-004	Alpha-BBO	200-900nm	ϕ15mm	<5x10-6	>15°	ϕ30x33mm	$1460
20703-005	Calcite	350-2300nm	ϕ6mm	<5x10-5	>15°	ϕ15x22mm	$275
20703-006	Calcite	350-2300nm	ϕ10mm	<5x10-5	>15°	ϕ25.4x33mm	$415
20703-007	Calcite	350-2300nm	ϕ12.7mm	<5x10-5	>15°	ϕ25.4x39mm	$510
20703-008	Calcite	350-2300nm	ϕ15mm	<5x10-5	>15°	ϕ30x45.5mm	$860
20703-009	Calcite	350-2300nm	ϕ6mm	<5x10-5	>25°	ϕ15x26mm	$415
20703-010	Calcite	350-2300nm	ϕ10mm	<5x10-5	>25°	ϕ25.4x38mm	$495
20703-011	Calcite	350-2300nm	ϕ12.7mm	<5x10-5	>25°	ϕ25.4x46mm	$660
20703-012	Calcite	350-2300nm	ϕ15mm	<5x10-5	>25°	ϕ30x53mm	$1110

Wollaston Prism



- Four Substrate Materials: Alpha-BBO, Calcite, YVO4, and Quartz
- High extinction ratio 200000:1 (Alpha-BBO, YVO4); 20000:1(Calcite, Quartz)
- Generating symmetrical light beams of orthogonal polarization, equal intensities, and large separation angles
- Various coating options: broadband AR coatings (190-3500nm, 350-2300nm, 500-4000nm, 200-2300nm), P-coatings
- Standardized aperture sizes including φ6mm, φ10mm, φ12.7mm, φ15mm, φ20mm available in stock
- Separation Angle 2°, 15°, 18°, 20°,or custom

A Wollaston Prism, or Wollaston polarizer is a polarization optical component consisting of two right-angle prisms with their optical axes aligned in orthogonal directions. Wollaston prisms also pertain to the crystalline birefringent polarizer kind.

When a natural light beam is projected at 90 degrees on the end face of the Wollaston prism, due to the birefringent phenomenon, the light is split into two polarization components with their oscillation directions perpendicular to each other. When the two components enter the first prism, because the incident angle is 90 degrees, both the s polarization (i.e. the ordinary light) and the p polarization (i.e. the extraordinary light) are not refracted but propagate at different speeds. When the e light and o light enter the second prism, because the optical axis of the second prism is perpendicular to the first prism, hence, in the second prism, the o component in the first prism switches into the e component, and the e component in the first prism switches into the o component. In the end, both the e light and o light experience a symmetrical angular deviation.

The emerging two beams are of orthogonal linear polarization, identical intensities, and large separation angles. Since the deviation angle of the Wollaston polarizer is sensitive to shifts in wavelength, Wollaston prisms are often used in spectroscopes and polarization analyzers. Furthermore, Wollaston polarizers are also quite compelling in lab applications because a pair of light beams consisting of both ordinary light and extraordinary light that are symmetrical about their axis of initial propagation could be obtained.

Hangzhou Shalom EO offers Standard and Custom Versions of Wollaston Prisms, made from Alpha-BBO, Calcite, YVO4, and Quartz. The products feature a cemented architecture, where the adhesive is applied outside the area of the clear aperture. The substrates could be uncoated, or coated with Broadband AR Coating (Bnadwidth 190-3500nm, 350-2300nm, 500-4000nm, 200-2300nm), Protective coating. The extinction ratio are 20000:1(Calcite), or 200000:1 (Alpha-BBO, YVO4). Standardized aperture sizes including φ6mm, φ10mm, φ12.7mm, φ15mm, and φ20mm are available in stock, and custom sizes are accessible through inquiries. The separation angles are diverse, comprising 2°, 15°,18°, and 20°, while other separation angles are procurable upon request.

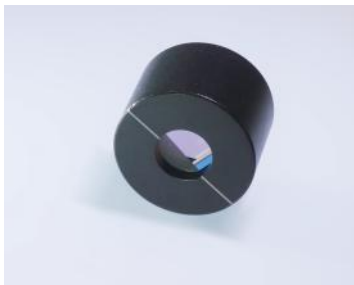
Common Specifications:

Item	MgF2	Alpha-BBO	Quartz	YVO4
Wavelength Range	130-7000nm	190-3500nm	200-2300nm	500-4000nm
Extinction Ratio	<5x10-5	<5x10-6	<5x10-5	<5x10-6
Surface Quality	20/10 S/D			
Beam Deviation	< 3 arc minutes			
Wavefront Distortion	<λ/4@633nm			
Damage Threshold	>200MW/cm2@1064nm, 20ns, 20Hz			
Coating	P Coating or AR Coating			
Mount	Black Anodized Aluminum			

Product List of Wollaston Prism

Code	Material	Wavelength	Aperture	Separation Angle	Extinction Ratio	Mount	Unit Price
20704-001	Alpha-BBO	190-3500nm	ϕ6mm	>15°	<5x10-6	ϕ15x15mm	$230
20704-002	Alpha-BBO	190-3500nm	ϕ10mm	>15°	<5x10-6	ϕ25.4x19mm	$415
20704-003	Alpha-BBO	190-3500nm	ϕ12.7mm	>15°	<5x10-6	ϕ25.4x21mm	$495
20704-004	Alpha-BBO	190-3500nm	ϕ15mm	>15°	<5x10-6	ϕ30x23mm	$660
20704-005	Alpha-BBO	190-3500nm	ϕ20mm	>15°	<5x10-6	ϕ38x29mm	$1460
20704-006	Calcite	350-2300nm	ϕ6mm	>18°	<5x10-5	ϕ15x15mm	$215
20704-007	Calcite	350-2300nm	ϕ10mm	>18°	<5x10-5	ϕ25.4x19mm	$340
20704-008	Calcite	350-2300nm	ϕ12.7mm	>18°	<5x10-5	ϕ25.4x21mm	$445
20704-009	Calcite	350-2300nm	ϕ15mm	>18°	<5x10-5	ϕ30x23mm	$495
20704-010	Calcite	350-2300nm	ϕ20mm	>18°	<5x10-5	ϕ38x29mm	$985
20704-011	YVO4	500-4000nm	ϕ6mm	>20°	<5x10-6	ϕ15x15mm	$260
20704-012	YVO4	500-4000nm	ϕ10mm	>20°	<5x10-6	ϕ25.4x19mm	$400
20704-013	YVO4	500-4000nm	ϕ12.7mm	>20°	<5x10-6	ϕ25.4x21mm	$495
20704-014	YVO4	500-4000nm	ϕ15mm	>20°	<5x10-6	ϕ30x23mm	$680
20704-015	YVO4	500-4000nm	ϕ20mm	>20°	<5x10-6	ϕ38x29mm	$1460
20704-016	Quartz	200-2300nm	ϕ6mm	>2°	<5x10-5	ϕ15x20mm	$215
20704-017	Quartz	200-2300nm	ϕ10mm	>2°	<5x10-5	ϕ25.4x28mm	$340
20704-018	Quartz	200-2300nm	ϕ12.7mm	>2°	<5x10-5	ϕ25.4x33mm	$445
20704-019	Quartz	200-2300nm	ϕ15mm	>2°	<5x10-5	ϕ30x38mm	$495
20704-020	Quartz	200-2300nm	ϕ20mm	>2°	<5x10-5	ϕ38x48mm	$985

Rochon Prism



- Four Substrate Materials: Alpha-BBO, Calcite, YVO4, and Quartz
- High extinction ratio 200000:1 (Alpha-BBO, YVO4); 20000:1(MgF2, Quartz)
- Various coating options: broadband AR coatings (190-3500nm, 500-4000nm, 130-7000nm, 200-2300nm), P-coatings
- Standardized aperture sizes including φ6mm, φ10mm, φ12.7mm, φ15mm, φ20mm available in stock
- Separation Angle 1°, 8°, 10°, or custom

A Rochon Prism, or Rochon Polarizer is a polarizing optical element made of two wedged, constituent prisms. The orientations of the optical axes of the two prisms are perpendicular to each other (i.e. The optical axis of one of the wedges is parallel to the normal of incidence, and the optical axis of the other wedge is perpendicular to the plane of incidence.) First, because the Rochon prism is made from birefringent crystal materials, it separates the incident light beam of spontaneous polarization into two components of orthogonal polarization: the s component (i.e. the ordinary light) and the p component (i.e. the extraordinary light). Since the optical axes of the two prisms of the Rochon polarizer are aligned in an orthogonal manner, the o light and e light will be switched in the second prism. Because the eo component hits the interface where the prisms assemble at 90°, it does not deviate. The oe light will be reflected at a certain angle, which is correlated to the refractive index of the birefringent t crystalline material, and the Wedge angle of the Rochon Polarizer.

In fact, the Rochon prisms function in a quite similar manner to the Wollaston prisms, except for the part that in the case of Rochon Prisms the ordinary light experiences no deviation.

Hangzhou Shalom EO offers a series of Off-the-Shelf and Custom Rochon Prisms, with prominent extinction ratios of 20000:1 (Alpha-BBO, YVO4) and 20000:1 (MgF2, Quartz). The two constituent prisms in each Rochon prism are combined using adhesive, with a black anodized aluminum housing mounted outside. The transmission spectrum spans from UV to MWIR. Three standard separation angles are available in stock: 1°, 8°, and 10°, whilst other separation angles and specifications could be tailored according to your needs.

Common Specifications:

Item	MgF2	Alpha-BBO	Quartz	YVO4
Wavelength Range	130-7000nm	190-3500nm	200-2300nm	500-4000nm
Extinction Ratio	<5x10-5	<5x10-6	<5x10-5	<5x10-6
Surface Quality	20/10 S/D			
Beam Deviation	< 3 arc minutes			
Wavefront Distortion	<λ/4@633nm			
Damage Threshold	>200MW/cm2@1064nm, 20ns, 20Hz			
Coating	P Coating or AR Coating			
Mount	Black Anodized Aluminium			

Product List of Rochon Prism

Code	Material	Wavelength	Aperture	Separation Angle	Extinction Ratio	Mount	Unit Price
20705-001	Alpha-BBO	190-3500nm	ϕ6mm	>8°	<5x10-6	ϕ15x15mm	$230
20705-002	Alpha-BBO	190-3500nm	ϕ10mm	>8°	<5x10-6	ϕ25.4x19mm	$415
20705-003	Alpha-BBO	190-3500nm	ϕ12.7mm	>8°	<5x10-6	ϕ25.4x21mm	$495
20705-004	Alpha-BBO	190-3500nm	ϕ15mm	>8°	<5x10-6	ϕ30x23mm	$660
20705-005	Alpha-BBO	190-3500nm	ϕ20mm	>8°	<5x10-6	ϕ38x29mm	$1460
20705-006	YVO4	500-4000nm	ϕ6mm	>10°	<5x10-6	ϕ15x15mm	$260
20705-007	YVO4	500-4000nm	ϕ10mm	>10°	<5x10-6	ϕ25.4x19mm	$400
20705-008	YVO4	500-4000nm	ϕ12.7mm	>10°	<5x10-6	ϕ25.4x21mm	$495
20705-009	YVO4	500-4000nm	ϕ15mm	>10°	<5x10-6	ϕ30x23mm	$680
20705-010	YVO4	500-4000nm	ϕ20mm	>10°	<5x10-6	ϕ38x29mm	$1460
20705-011	MgF2	130-7000nm	ϕ6mm	>1°	<5x10-5	ϕ15x20mm	$230
20705-012	MgF2	130-7000nm	ϕ10mm	>1°	<5x10-5	ϕ25.4x28mm	$370
20705-013	MgF2	130-7000nm	ϕ12.7mm	>1°	<5x10-5	ϕ25.4x33mm	$460
20705-014	MgF2	130-7000nm	ϕ15mm	>1°	<5x10-5	ϕ30x38mm	$615
20705-015	MgF2	130-7000nm	ϕ20mm	>1°	<5x10-5	ϕ38x48mm	$1260
20705-016	Quartz	200-2300nm	ϕ6mm	>1°	<5x10-5	ϕ15x20mm	$215
20705-017	Quartz	200-2300nm	ϕ10mm	>1°	<5x10-5	ϕ25.4x28mm	$340
20705-018	Quartz	200-2300nm	ϕ12.7mm	>1°	<5x10-5	ϕ25.4x33mm	$450
20705-019	Quartz	200-2300nm	ϕ15mm	>1°	<5x10-5	ϕ30x38mm	$495
20705-020	Quartz	200-2300nm	ϕ20mm	>1°	<5x10-5	ϕ38x48mm	$985

Polarization Plane Rotator



- Excellent alternative of half-wave plate for narrow waveband laser
- Made of quartz crystal, tiled with AR coatings
- No alignment required
- Rotates polarization at a fixed angle
- Custom rotation angles available
- Available in stocked and custom versions

Polarization Plane Rotator is an excellent substitute for waveplates and retarders which alters light of linear polarization at a specific angle with independence of rotation around its optical axis. This is because polarization plane rotators are made of crystalline quartz which exhibits special optical properties. The cause of these special properties is the unique lattice structure of quartz. Depending on the chain rotation direction, there is "right" and "left" quartz which rotates polarization clockwise or counter-clockwise. The thickness of the polarization plane rotator determines the angles of rotation.

The orientation of the quartz crystals selected to manufacture the polarization plane rotator is c-cut so that no stringent alignment between the polarization plane rotator and the incident beam is needed, the user only needs to ensure that the incident beam is projected perpendicularly to the polarization plane rotator. Polarization plane rotators are, in most circumstances, intended for changing the polarization state of a narrow laser wavelength, and sensitive to ambient temperature to a subtle extent.

Hangzhou Shalom EO offers Stock and Custom Polarization Plane Rotators with fixed 45° or 90° rotation angles. The products are made of bulk quartz crystals. The stocked products are oriented for common laser-line wavelengths including 532nm, 633nm, 800nm, 1030nm, and 1064nm, anti reflection coatings are tiled to enhance the transmission performance.

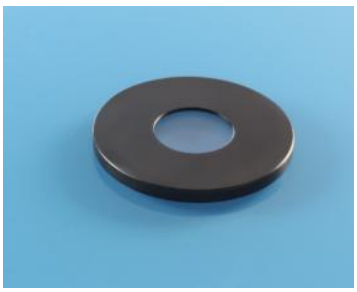
Common Specifications:

Material	Crystal Quartz 200-2500nm	Rotation Accuracy	<5 arc minutes
Parallelism	<10 arc seconds	Wavefront Distortion	λ/4@632.8nm
Surface Quality	20/10 S/D	Rotation	clockwise and counter-clockwise
Coating	AR coating available R<0.25%@central wavelength		

Product List of Polarization Plane Rotator

Code	Wavelength	Size	Orientation	Mount	Unit Price
20710-001	532nm	20mm	45°	Mounted	$140
20710-002	532nm	20mm	90°	Mounted	$140
20710-003	633nm	20mm	45°	Mounted	$140
20710-004	633nm	20mm	90°	Mounted	$140
20710-005	800nm	20mm	45°	Mounted	$140
20710-006	800nm	20mm	90°	Mounted	$140
20710-007	1030nm	20mm	45°	Mounted	$140
20710-008	1030nm	20mm	90°	Mounted	$140
20710-009	1064nm	20mm	45°	Mounted	$140
20710-010	1064nm	20mm	90°	Mounted	$140

Achromatic Depolarizers



- Optic Axis Alignment Not Required
- Ideal for Broadband Light Sources and Large Diameter (>6 mm) Monochromatic Beams
- Cemented Design
- Coating Options: Uncoated, or AR coated
- Customized sizes and wavelengths are available upon request

An Achromatic Depolarizer consists of two wedged prisms made of birefringent materials with their fast axes aligned at 45 deg to each other, and one of the prisms is twice as thick as the other. Achromatic depolarizers transform polarized light into a pseudo-polarized state, which means the polarization of the incident beam is randomized rather than being converted into a completely unpolarized state. Light of linear polarization from the broadband light source will have a polarization that is sensitive to both spatial variation and wavelength shifts.

The 45° offset allows the plates to depolarize all input polarization states. Because the plates are wedged, the path length through each birefringent plate varies according to the beam position, and each position on the aperture will have a net birefringence and a final polarization state which is dependent on spatial variations. For a beam of large diameter, the input light will be transformed into unpolarized light.

Hangzhou Shalom EO offers Custom Achromatic Depolarizers made from crystal quartz of cemented structure. The two wedged prisms are assembled with a metal ring in between, and the adhesive is applied outside the clear aperture with caution to ensure unhindered optical transmittance. The distinguished design of the quartz-wedged depolarizers relieves the need to orient the optic axes of the depolarizer at specific angles, which is useful if the depolarizer is used in an application where the initial polarization of the light is unknown or varies with time. We provide two standard sizes:12.7mm and 25.4mm, while other custom specifications could be tailored.

Common Specifications:

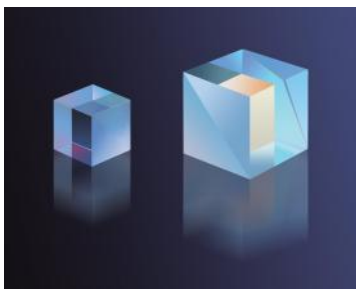
Material	Quartz 200-2500nm	Dimension Tolerance	±0.2mm
Surface Quality	Better than 60/40 S/D	Beam Deviation	<3 arc minutes
Wavefront Distortion	<λ/4@632.8nm	Clear Aperture	>90% central
Coating	Uncoated, AR coating available		

Modules or Types:

Part No.	Wavelength Range (nm)	Diameter (mm)
DOP4012	200-2500	12.7
DOP4025	200-2500	25.4

Note: Other sizes and wavelengths are available upon requirement.

Beamsplitter Cubes



A Beamsplitter Cube is a cubic optical component consisting of two right-angle prisms. There are two categories of beamsplitter cubes if we separate them in terms of sensitivities to polarization: one is a Polarizing Beamsplitter Cube or PBS cube, and another is a Non-Polarizing Beamsplitter Cube.

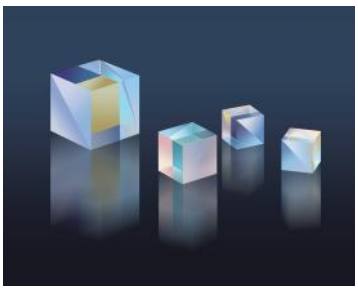
Beamsplitter cubes are often used to separate a light beam into two, or the cubes can also be used in reverse, to combine two beams into one. Beamsplitter cubes have extensive applications in a lot of fields, including laser, semiconductor, and photonics instrumentation. The dielectric beamsplitter coating at the interface of the polarizing beamsplitter cube splits an unpolarized light into two orthogonal polarizations: the s component and the p component and blocks the s component while allowing the p component to proceed, thus attaining the desirable, pure polarized light. A nonpolarizing beam splitter cube functions using the hybrid metallic-dielectric coating furnished at the hypotenuse of one of the prisms, which filters light according to a certain proportion without changing the initial polarization state of the light source.

Speaking in comparison, polarizing beamsplitters work better for high-power lasers because their coatings contain no metal, whilst nonpolarizing beamsplitters are more recommended for low to medium-power scales since the metallic-dielectric coatings cause the damage threshold to decline concerning polarizing beamsplitter cube.

The architecture of the beamsplitter cube could be manifold, including cemented, air-spaced, or optical contact. Among them, the air-spaced and optical contacted structures are preferred for usages requiring higher LIDTs (Laser-Induced Damage Thresholds) since these two structures are adhesive-free. If the constituent prisms of the beamsplitter cubes are cemented together, the user should be cautious that the light should be projected towards the prism coated with the beamsplitter coating to avoid causing injuries to the cement. However, even if the aforesaid situation is avoided, cemented beamsplitter cube will still have a lower damage threshold than cubes assembled using the other two methods since adhesives often exhibit low thermal endurance.

Hangzhou Shalom EO offers Stocked and Custom Beamsplitter Cubes, including High Power Polarizing Beamsplitter Cubes, Polarizing Beamsplitter Cubes, and Non-Polarizing Beamsplitter Cubes. Various Broadband and laser-line options spanning the spectral range from UV, VIS, to IR, are available either as standard versions that could be ordered online or as custom versions that could be specified upon request. Shalom EO is a proficient supplier and manufacturer of optics and laser components, with superb production craft, we are capable of delivering Beamsplitter with an extinction ratio of a tremendous range between 300:1 to 10000:1. Besides, we are also confident about our flexible and cutting-edge workshop to provide both standard PBS cube and high precision laser-grade polarizing beamsplitter cube.

High Power Laser Polarizing Beamsplitter Cube



- Optical-contact structure to allow high power applications(LIDT >15J/cm2@1064nm, 20ns, 20Hz)
- Stocked and custom PBS cubes available (Standard extinction ratio 1000:1, Max. extinction ratio 10000:1)
- Various Wavelengths Available: 355 nm, 405 nm, 515nm, 532 nm, 633 nm, 780 - 808 nm, 700-900nm, 1030nm,1064 nm
- Recommended incident angle: 45°or Brewster angle
- High-precision Laser-grade polished

A Polarizing Beamsplitter Cube is an optical component consisting of two right-angle triangular prisms combined together, with a dielectric beamsplitter coating furnished at the one prism's hypotenuse. The working principle of polarizing beamsplitter cubes is: when an unpolarized beam is incident on the polarizing beamsplitter cube, it is separated into two orthogonal polarization: the s component and the p component. Due to the existence of the dielectric, polarization-sensitive coating, The s polarization will be blocked at the interfaces of the prisms, while the p polarization continues to propagate and emerges from the polarizing beamsplitter cube. The contrast of the transmission of component s and component p measured at the exit of the PBS cube is the extinction ratio Tp: Ts of the polarization beamsplitter cube.

Shalom EO offer Stocked and Custom High Power Polarizing Beamsplitter Cubes made from Corning C7980-0F and BK7. Regarding the standard products, prevalent laser line wavelengths are available: 355nm, 515nm, 535nm, 808nm, 1030nm, and 1064nm, whilst custom broadband versions between 700-900nm are also procurable. A multi-layer dielectric beamsplitter coating is positioned at the interface of the two prism parts, and the four faces where light enters and exits are anti-reflection coated to mitigate reflection loss, contributing to an extinction ratio of 1000:1, whilst other wavelengths, bandwidths, and extinction ratios (Max. 10000:1) could be tailored upon request. Shalom EO utilizes an adhesive-free, optical-contacted method to assemble the constituent prisms, the cubes are high-precision laser-grade polished to ensure minute wavefront distortion and allow optical contact, without the possibilities of degradation of cement, this implies a higher damage threshold and power limit of our products. Our PBS cubes feature an exceptional LIDT of >15J/cm2@1064nm, 20ns, 20Hz. Furthermore, the optical contact architecture is viable on the premise that the interfaces of the prisms are high-precision polished, so optical contact could reduce thermal absorption and minimize scattering loss at the same time.

Common Specifications:

Item	Narrowband PBS	Broadband PBS
Wavelength(nm)	355, 405, 515, 532, 633, 808, 880, 1030, 1064	700-900
Extinction Ratio	>1000:1, >2000:1	>1000:1, Max>10000:1(Custom)
Surface Quality	40/20 S/D，20/10 S/D	
Beam Deviation	< 3 arc minutes	
Wavefront Distortion	<λ/4@633nm	
Transmittance	Tp>95%, Ts<0.1%	
Coating	Polarizing beamsplitter coating on the hypotenuse and AR coating on the entrance and exiting faces	
Damage Threshold	>10J/cm2@1064nm, 10ns, 10Hz	

Product List of High Power Laser Polarizing Beamsplitter Cube

Code	Material	Wavelength	Size	Laser Damage Threshold	Unit Price
20706-001	C7980-0F	355nm	12.7x12.7x12.7mm	>15J /cm2@1064nm, 20ns, 20Hz	$280
20706-005	BK7	515nm	12.7x12.712.7mm	>15J/cm2@1064nm, 20ns, 20Hz	$280
20706-002	BK7	532nm	12.7x12.7x12.7mm	>15J/cm2 @1064nm, 20ns, 20Hz	$280
20706-003	BK7	808nm	12.7x12.7x12.7mm	>15J /cm2@1064nm, 20ns, 20Hz	$280
20706-006	BK7	1030nm	12..7x12.7x12.7nm	>15J/cm2 @1064nm, 20ns, 20Hz	$280
20706-004	BK7	1064nm	12.7x12.7x12.7mm	>15J/cm2 @1064nm, 20ns, 20Hz	$280

Polarizing Beamsplitter Cube



- Broadband or laser wavelength versions available
- Common bandwidths and Laser wavelengths: 450-950nm, 650-950nm, 900-1300nm, 1200-1600nm; 532nm, 633nm, 800nm, 1064nm, 1550nm.
- Cemented structures (LIDT 0.2 J/cm2@1064nm, 20ns, 20Hz)
- Competitive price
- Extinction Ratio >500:1, >1000:1
- Recommended incident angle: 45°or Brewster angle

A Polarizing Beamsplitter Cube is a solid glass optical element composed of two right-angle prisms, with their hypotenuses attached together to form a cubic shape. A multi-layer dielectric beamsplitter coating of multiple films will be furnished at the interface of the two right-angle prisms. When an unpolarized light hits the PBS cube, it is split into two polarizations perpendicular to each other: the s polarization and the polarization. The dielectric coating reflects the s polarization at 90 degrees and intercepts it, whilst permitting the p polarization to pass and exit. This is how a polarizing beam splitter cube operates. Compared to its cousin, plate beamsplitter, a beamsplitter cube is heavier and more difficult to fabricate large-size ones, however, it does not manifest beam shift effects, and the lengths of the reflected and transmitted light paths are equal, which results in less aberration.

Shalom EO offers Off-the-shelf and Custom Polarizing Beamsplitter Cubes made from ZF Glass. Regarding the standard products, both broadbands polarizing beamsplitter cubes (450-950nm, 650-950nm, 900-1300nm, 1200-1600nm) and laser line polarizing beamsplitter cubes (355nm，532nm，633 nm，808nm，880nm，1064nm，1310nm，1550nm) are available at an extinction ratio of 500:1 or 1000:1 with a beamsplitter coating furnished at the interface of the prisms and anti-reflection coatings at the exits. The dimensions are also diverse, 12.7x12.7x12.7 is available as off-the-shelf versions, while other standardized dimensions including 10x10x10, 15x15x15, 20x20x20, 25.4x25.4x254.4 could be offered upon request. The reflected beam will have an extinction ratio of about 20:1 to 100: 1 depending on the beam splitter.

This page highlights our cemented polarizing beamsplitter cubes, with a damage threshold of 0.2 J/cm2@1064nm, 20ns, 20Hz. We also provide an adhesive-free, optical-contacted, high-power version of the polarization beamsplitter cube. These PBS cubes feature an exceptional LIDT of >15J/cm2@1064nm, 20ns, 20Hz. Click on the bold text to learn more if you are interested.

Common Specifications:

Item	Laser Line PBS	Broadband PBS
Wavelength	355，532，633，808，880，1064，1310，1550	700-900
Extinction Ratio	>1000:1, >2000:1	450-650nm, 650-950nm,900-1200nm, 1200-1600nm
Surface Quality	60/40 S/D，40/20 S/D	
Beam Deviation	< 3 arc minutes	
Wavefront Distortion	<λ/4@633nm	
Transmission	Tp>95%, Ts<0.1%	
Coating	PBS+AR Coating	

Product List of Polarizing Beamsplitter Cube

Code	Material	Wavelength	Size	Extinction Ratio	Unit Price
20707-001	ZF Glass	450-650nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-002	ZF Glass	650-950nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-003	ZF Glass	900-1300nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-004	ZF Glass	1200-1600nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-005	ZF Glass	532nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-006	ZF Glass	633nm	12.7x12.7x12.7mm	1000:1	$92,5
20707-007	ZF Glass	808nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-008	ZF Glass	880nm	12.7x12.7x12.7mm	1000:1	$92.5
20707-009	ZF Glass	1064nm	12.7x12.7x12.7nm	1000:1	$92.5
20707-010	ZF Glass	1310nm	12.7x12.7x12.7nm	1000:1	$92.5
20707-011	ZF Glass	1550nm	12.7x12.7x12.7mm	1000:1	$92.5

Non-Polarizing Beamsplitter Cubes



- Spectral band options: 450-650nm(standard), 650-950nm(inquire), 900-1200nm(inquire) and 1200-1600nm(inquire)
- Hybrid metallic-dielectric coating
- Insensitive to polarization and angle of incident
- Fit for low-power lasers
- Transmission and reflection rate of s and p polarization ≤5%

Non-Polarizing Beamsplitter Cube is a cubic optical element consisting of a pair of right-angle triangular glass blocks, with a similar structure just like its polarizing counterparts. Non-polarizing beamsplitter cubes are often assigned to split light into a 50/50 ratio or a specific ratio without altering the polarization state of the incident light. One of the interfaces of the prisms is gilded with a hybrid metallic-dielectric coating. The hybrid coating is insensitive to polarizations and reflects, and transmits light according to a specific portion. This means the beamsplitter cube can manipulate the ratio of the extinction with more freedom without concerns about the polarization components. The four other faces where light enters and exits are all coated with anti-reflection coatings to attenuate reflection loss. Therefore, a non-polarizing beamsplitter would be an excellent option when the original polarization state of the incident light needs to be preserved. However, the metal content in the hybrid coating implies the cube element has a much lower damage threshold, and that non-polarizing beamsplitter cubes are not so great at handling high-power lasers.

Hangzhou Shalom EO offers Standard and Custom Non-Polarization Beamsplitter Cubes with a series of bandwidths including 450-650nm (standard), 650-950nm(inquire), 900-1200nm(inquire), and 1200-1600nm(inquire), or other bandwidths. We incorporate durable metallic-dielectric coating at the interface and AR coatings at the four faces. Our non-polarizing beamsplitter cube is of low polarization dependence, with the transmission and reflection rate of s polarization and p polarization within 5%. A large selection of dimensions is accessible, including 10x10x10mm, 12.7x12.7x12.7mm, 15.0x15.0x15.0mm, 20.0x20.0x20.0mm, and 25.4x25.4x25.4mm.

Specifications:

Wavelength	450-650nm, 650-950nm, 900-1200nm, 1200-1600nm	Polarization	T/R=46/46, |Ts-Tp|<5%, |Rs-Rp|<5%
Surface Quality	60/40, 40/20, S/D	Beam Deviation	<3 arc min
Wavefront Distortion	<λ/4@633nm	Clear Aperture	>80% central diameter
Material	K9	Dimension	10.0x10.0x10.0mm 12.7x12.7x12.7mm 15.0x15.0x15.0mm 20.0x20.0x20.0mm 25.4x25.4x25.4mm

Waveplates and Retarders



Waveplates or Phase Retardation Plates, Retarders are polarizing optics used to manipulate the polarization state of the transmitted light without attenuating, deviating, or displacing the light. The working principle of a waveplate, or a retardation plate, is to utilize the birefringence of certain materials which separates the incident light beam into two components along two orthogonal optical axes within the birefringent material. The phase retardation between the two components of the incident light contributes to changes in the polarization state. (There are also the Fresnel Rhomb Retarders which work through a different principle, that is, the Total Internal Reflection.) It is possible to control the phase shift between the two polarization components of a light wave, by adjusting the thickness of the waveplates. Some external factors, such as the variation of wavelength, ambient temperature, and the angle of the incident might all have impacts on the retardation of waveplates and retarders.

The most common waveplates are half waveplates and quarter waveplates. A half waveplate, sometimes equivalently called half wave retarder or half-wavelength plate, induces a retardation of 1/2 lambada between the fast component and the slow component, resulting in rotation of the polarization direction of the emerging light. Changing the angle between the original plane of polarization and the axes of the half waveplate, the angle rotated could be governed. Half wavelength plates are often applied for transforming vertical polarization into horizontal polarization and vice versa when orienting the incident linear polarization at 45 degrees to the optical axis. Quarter waveplates or quarter retardation plates, on the other hand, generate retardation of λ/4 between the fast and slow components, quarter waveplates are often used for conversion of linear polarization to circular polarization or vice versa. Besides, Shalom EO also offers octadic waveplates and full waveplates. Standard-mounted modules of waveplates are configured with Dia. 25.4mm, C.A. 18mm aluminum mounts, which are all engraved with fast axes on the outside in the form of a straight line. The unmounted versions also have their fast axes indicated.

Hangzhou Shalom EO offers waveplates and phase retardation plates, retarders in various forms including True Zero-Order, Zero-Order, Low-Order, Dual Wavelength Waveplates, Super Achromatic, Achromatic Waveplates, Fresnel Rhomb Retarders. In Shalom EO, feel free to pick the retardation and wavelength of your interest, where a wide selection of half-wave, quarter-wave, or other wavelengths of retardation for single wavelength, dual/triple wavelength options, or broadband/achromatic wavelength ranges are available, with the applicable spectral ranges from UV to Infrared wavelength ranges. These waveplates and retarders are made from a manifold of materials including Quartz, Magnesium Fluoride (MgF2), and fused silica, with single-plate, double-plate, sixfold-plate, or substrates-combined structures. The assembled waveplates are either aligned using cementing, optical contacting, or with an air-spaced design. Both off-the-shelf and customized modules are available.

Features of Waveplate Types

Waveplate Category		Construction	Material	Wavelength Range	Temperature Stability	Damage Threshold	Parallelism	Retardation Tolerance
Zero Order Waveplate	Air Spaced	Two plates	Quartz or MgF2	Broad	High	Greater	Splendid	Higher
	Optically Contacted	Two plates	Quartz or MgF2	Broad	High	Great	Splendid	Higher
	NOA61 Cemented	Two plates	Quartz or MgF2	Broad	High	Low	Nice	High
Multiple Wavelength Waveplate	Dual Wavelength	Single plate	Quartz or MgF2	Narrow	Low	Greater	Splendid	General
	Triple Wavelength	Single plate		Narrow	Low	Greater	Splendid	General
True Zero Order Waveplate	With Substrate	One plate + One Substrate	Quartz or MgF2 + BK7 Substrate	Broad	High	Low	Splendid	Higher
	Free standing	Single Plate	Quartz or MgF2	Broad	Very high	Greater	Splendid	Higher
Achromatic Waveplate	Air Spaced	Two Plates	Quartz and MgF2	Very broad	High	Greater	Nice	High
	NOA61 Cemented	Two Plates		Very broad	High	Low	Nice	High
Super Achromatic Waveplate		Six Plates	Quartz and MgF2	Extremely broad	Very high	Low	Nice	High
Fresnel Rhomb Retarder	Quarter Wave Retarder	Single Prism	BK7 or UV Fused Silica or ZnSe	Extremely broad	High	Great	Splendid	General
	Half Wave Retarder	Two Quarter Prisms Cemented						General
Low Order Waveplate		Single Plate	Quartz or MgF2	Narrow	Low	Greater	Splendid	General

Recommendation Index

Not Recommendable ← → Recommendable

Air Spaced Zero Order Waveplates



- Operational wavelengths range from 200nm to 2000nm (Quartz), 190nm to 7000nm (MgF2)
- Air spaced double-plate structure
- High temperature stability and better retardation steadiness than low order waveplates
- High damage threshold (500 MW/cm2) supporting high-power lasers
- Various retardations: Half, quarter, octadic, or full retardations
- Both off-the-shelf and custom versions are available

A Zero Order Waveplate consists of two waveplates made from Quartz or Magnesium Fluoride, with their optical axes orthogonally aligned. Unlike multiple-order or low-order waveplates which produce the desired retardation together with a surplus of several wavelength shifts, the terminal net retardation gained from a zero-order waveplate is the difference between the two individual retardations obtained from the two constituent waveplates, which is a function of the thickness difference between the two waveplates. This design offsets the unfavorable retardation shifts occurring along with the fluctuations of the input wavelength since the detrimental shifts in the first plate will be compensated by the second plate. Therefore, zero-order waveplates are far less sensitive to changes in temperature and wavelength than their multi-order counterparts. However, changes in the angle of incidence will still induce corresponding phase shifts.

Hangzhou Shalom EO offers Zero Order Half Waveplates, Zero Order Quarter Waveplates, and Zero Order Octadic Waveplates. Half Wave Zero Order Waveplates, with retardation of lambda/2, could rotate the polarization plane of linearly polarized light. Quarter Zero Order Waveplates are often selected to transform linear polarization into circular polarization and vice versa. An Octadic Waveplate produces a retardation of lambda/8, it is extensively incorporated in applications of nonlinear optical systems, optical time-multiplexing systems, optical sensors, special interferometers, synchronous phase shifters, etc.

The operational wavelengths broadly range from 200nm to 2000nm (Quartz), and 190nm to 7000nm (MgF2). The air-spaced modules, with the construction of a designed air gap between the two constituent plates, feature exceptionally promoted damage thresholds suitable for high-power laser systems. The products are available in both off-the-shelf and custom versions. As for the off-the-shelf air-spaced zero-order waveplates,26 specifications with standard 18mm apertures and 25.4mm mounts are available, with the essential parameters and curves individually listed in our product catalog and on our website for browsing through and quick selection. Shalom EO could also provide custom products tailored according to your requirements. Besides, Zero Order Waveplates with NOA61 Cemented structures and Zero Order Waveplates with Optically Contacted, glue-free structures are also on sale in Shalom EO.

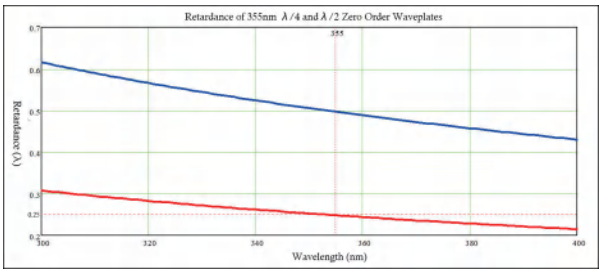
Specifications:

Material	Quartz or MgF2	Wavelength	200-2000nm (Quartz), 190-7000nm (MgF2)
Retardation	λ/4 or λ/2	Aperture	18mm
Surface Quality	20/10 S/D	Parallelism	<1 arc Sec
Retardation Tolerance	λ/60-λ/200(λ<400nm), λ/200-λ/400(400nm<λ<700nm), λ/400-λ/600(λ>700nm)	Damage Threshold	>500 MW/cm2
Coating	AR coating	Mounted Diameter	25.4mm (1 inch)

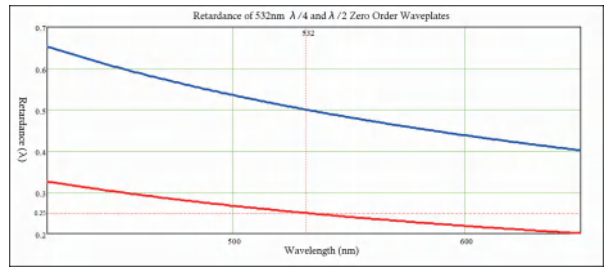
Retardation Curves:

The following graphs illustrate the retardation of Zero Order Waveplates over the wavelength ranges

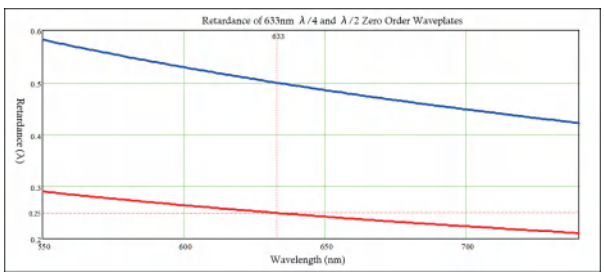
1. 355nm Zero Order Half Waveplates and Quarter Waveplates



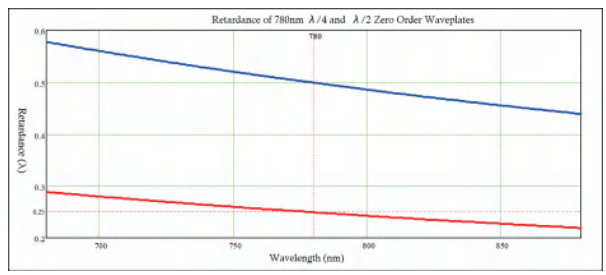
2. 532nm Zero Order Half Waveplates and Quarter Waveplates



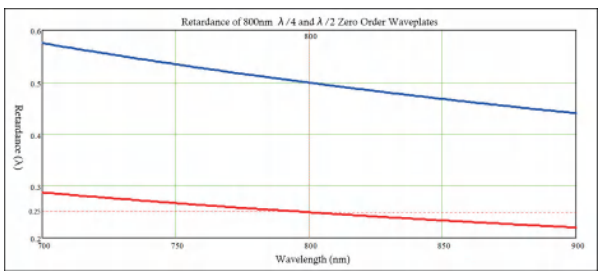
3. 633nm Zero Order Half Waveplates and Quarter Waveplates



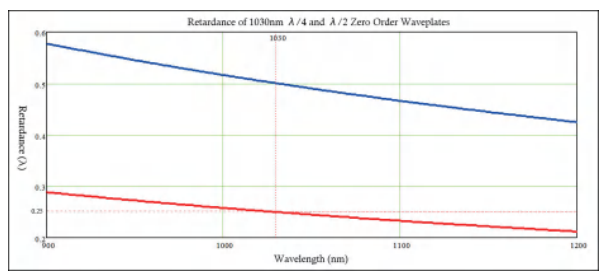
4. 780nm Zero Order Half Waveplates and Quarter Waveplates



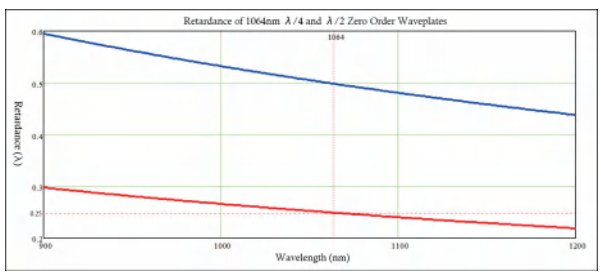
5. 800nm Zero Order Half Waveplates and Quarter Waveplates



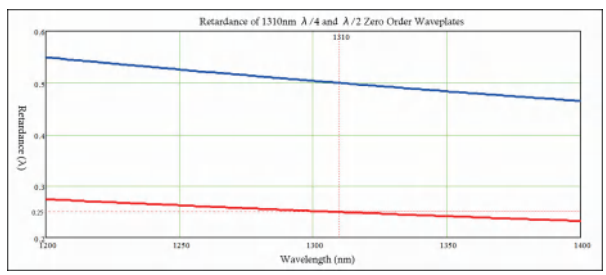
6. 1030nm Zero Order Half Waveplates and Quarter Waveplates



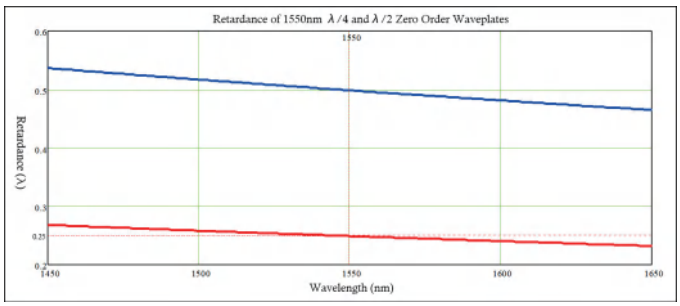
7. 1064nm Zero Order Half Waveplates and Quarter Waveplates



8. 1310nm Zero Order Half Waveplates and Quarter Waveplates



9. 1550nm Zero Order Half Waveplates and Quarter Waveplates



Product List of Air Spaced Zero Order Waveplates

Code	Wavelength	Retardation	Aperture	Mount	Unit Price
2085-001	355nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-002	355nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-003	405nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-004	405nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-005	532nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-006	532nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-007	633nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-008	633nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-009	780nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-010	780nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-011	800nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-012	800nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-013	808nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-014	808nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-015	850nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-016	850nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-017	980nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-018	980nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-027	1030nm	λ/8	18mm	Diameter 25.4mm (1")	$155.0
2085-019	1030nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-020	1030nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-021	1064nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-022	1064nm	λ/2	18mm	Diameter 25.4mm (1"⊠	$125.0
2085-023	1310nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-024	1310nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0
2085-028	1550nm	λ/8	18mm	Diameter 25.4mm (1")	$155.0
2085-025	1550nm	λ/4	18mm	Diameter 25.4mm (1")	$125.0
2085-026	1550nm	λ/2	18mm	Diameter 25.4mm (1")	$125.0

Optically Contacted Zero Order Waveplates



- Optically contacted, glue-free structure
- Wide operational wavelength range and high temperature-stability
- High damage threshold (>500 MW/cm2) and eminent surface flatness
- Wavelength range: 200-2000nm for Quartz and 190-7000nm for MgF2
- Anti Reflection Coating (R<0.2%)
- Better retardation steadiness than low order waveplates

Zero Order Waveplate, consisting of Quartz or Magnesium Fluoride Waveplate with their optical axes orthogonally aligned, is a preferable candidate for applications requiring higher wavelength and temperature stability than low order or multiple order waveplates. Unlike multiple order waveplates which produce the designated fractional retardation together with a few numbers of full wavelength retardations, Zero Order Waveplates produce exactly the retardation of interest. A Zero Order Waveplate is constructed with the fast axis of one plate aligned with the slow axis of the other. And the net retardation gained is a function of the thickness difference between the two plates. Utilizing the double waveplates structure, a Zero Order Waveplate effectively offsets the unfavorable sensibility of retardation, since the disturbing retardation shifts in the first plate will be compensated after light emerges from the second plate, thus making Zero Order Waveplates substantially far less sensitive to changes in temperature and wavelength than their multi-order counterparts. However, changes in the angle of incidence will still affect the phase delay.

The surfaces of an optically contacted waveplate are polished with high precision to obtain extremely high surface quality(parallelism<1 arc sec) , so that the two plates stick together under the effect of intermolecular forces instead of using glues. Without glue, binder, or any other adhesives, optically contacted waveplates could maintain the physical and optical qualities as good as bulk solid. Also, the absence of adhesive reduces the risk of the blurring of the aperture resulting from the melting of glue if temperatures are high. However, note that superior surface quality also implies higher sensitivity to contaminations and scratches. Although the high precision polishing required for an Optically Designed Structure necessitates a rigorous manufacturing procedure, thus inevitably raising the production cost, you could still buy at fairly cost-effective prices in Shalom EO.

Hangzhou Shalom EO provides Zero Order Half Waveplates, Zero Order Quarter Waveplates, and Zero Order Octadic Waveplates. Half Zero Order Waveplates, with retardation of lambda/2, could rotate the polarization plane of linearly polarized light. Quarter Zero Order Waveplates are often selected to transform linearly polarized light into circularly polarized light and vice versa. Whereas An Octadic Waveplate produces a retardation of lambda/8, it is extensively incorporated in applications of nonlinear optical systems, optical time-multiplexing systems, optical sensors, special interferometer, synchronous phase shifters, etc.

Optcially Contacted Zero Order Waveplates made from Quartz (suitable for the wavelength range 200-2000nm), or Magnesium Fluoride (MgF2) (suitable for the wavelength range 190-7000nm) are available in custom versions.

Common Specifications:

Material	Quartz	Wavelength Range	190-7000mm
Dimension Tolerance	±0.1mm	Surface Quality	20/10 S/D
Parallelism	<1 arc sec	Retardation Tolerance	< λ/500
Clear Aperture	>90%	Damage Threshold	>500 MW/cm2
Coating	AR coating	Mount	Black Anodized Aluminium

Features:

- Optically Contacted
- AR Coated, R<0.2%
- High Damage Threshold
- Better Temperature Band width
- Wide Wavelength Bandwidth

Modules or Types:

Standard Wavelength:

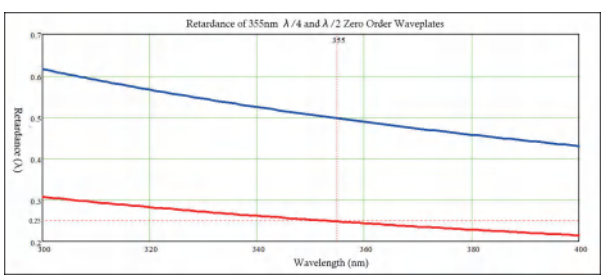
355nm, 532nm, 632.8nm, 780nm, 808nm, 850nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm

Zero Order Waveplates-Optically Contacted		
Quarter Waveplates P/N #	Half Waveplates P/N #	Diameter (mm)
WPO410	WPO210	10
WPO412	WPO212	12.7
WPO415	WPO215	15
WPO420	WPO220	20
WPO425	WPO225	25
WPO430	WPO230	30

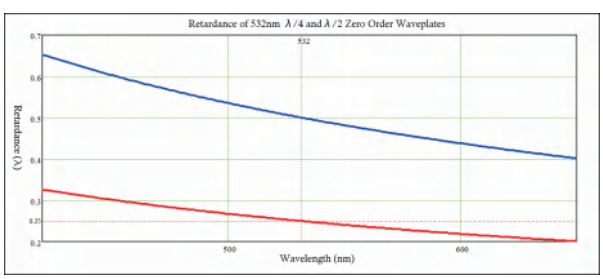
Retardation Curves:

The following graphs illustrate the retardation of Zero Order Waveplates over the wavelength ranges

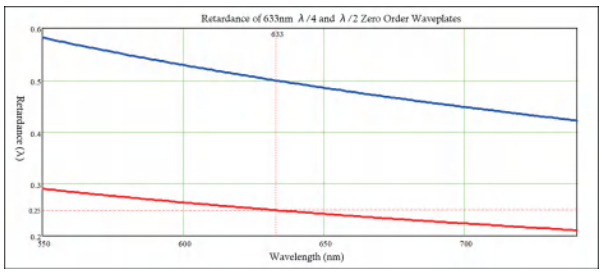
1. 355nm Zero Order Half Waveplates and Quarter Waveplates



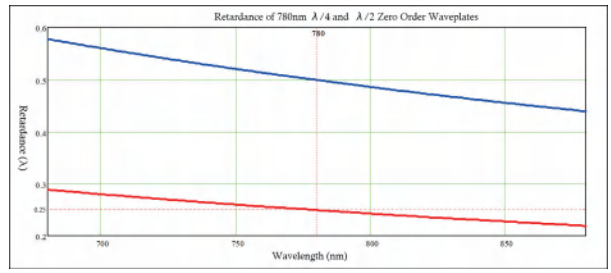
2. 532nm Zero Order Half Waveplates and Quarter Waveplates



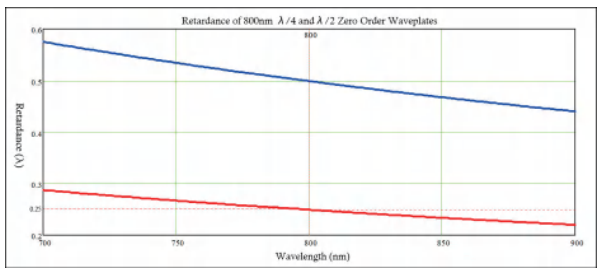
3. 633nm Zero Order Half Waveplates and Quarter Waveplates



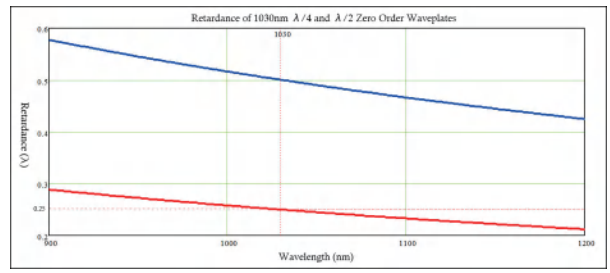
4. 780nm Zero Order Half Waveplates and Quarter Waveplates



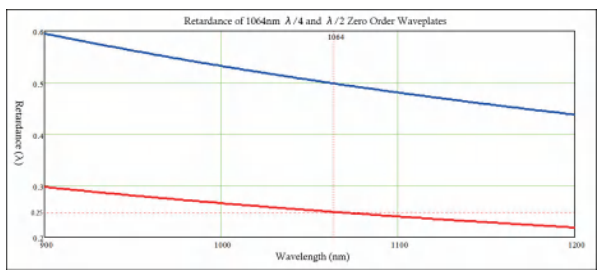
5. 800nm Zero Order Half Waveplates and Quarter Waveplates



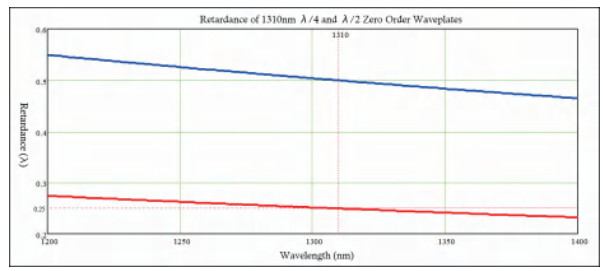
6. 1030nm Zero Order Half Waveplates and Quarter Waveplates



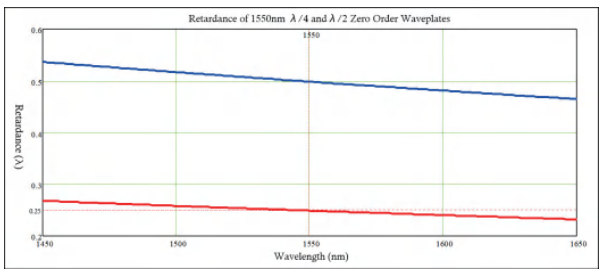
7. 1064nm Zero Order Half Waveplates and Quarter Waveplates



8. 1310nm Zero Order Half Waveplates and Quarter Waveplates



9. 1550nm Zero Order Half Waveplates and Quarter Waveplates



NOA61 Cemented Zero Order Waveplates



- NOA61 cemented structure
- Wide optional wavelength range and decent temperature stability
- Wavelength range: 200-2000nm for Quartz, 190-7000nm for MgF2
- Better retardation steadiness than low order waveplates
- Anti Reflection Coating (R<0.2%)

A Zero Order Waveplate is comprised of two waveplates made from Quartz or Magnesium Fluoride, with their optical axes orthogonally aligned. Unlike multiple-order waveplates which produce the desired retardation together with additional shifts of several wavelengths, zero-order waveplates have the advantage of producing exactly the retardation intended. The terminal net retardation gained from Zero Order Waveplate is the difference between the two individual retardations obtained in the two constituent waveplates, which is a function of the thickness difference between the two waveplates. Since the detrimental retardation shifts in the first plate will be compensated by the second plate, zero-order waveplates are substantially far less sensitive to changes in temperature and wavelength than their multi-order and low-order counterparts. However, changes in the angle of incidence will still induce corresponding phase shifts. Therefore, a Zero-order waveplate is a preferable candidate for applications requiring higher wavelength and temperature stability.

Hangzhou Shalom EO offers Zero Order Half Waveplates, Zero Order Quarter Waveplates, and Zero Order Octadic Waveplates. Half Zero Order Waveplates, with retardation of lambda/2, could rotate the polarization plane of linearly polarized light. Quarter Zero Order Waveplates are often selected to transform linearly polarized light into circularly polarized light and vice versa. An Octadic Waveplate produces a retardation of lambda/8, it is extensively incorporated in applications of nonlinear optical systems, optical time-multiplexing systems, optical sensors, special interferometers, synchronous phase shifters, etc.

Zero order Waveplates with NOA61 Cemented design are cemented by NOA61 (NOA61 is a UV-cured optical grade adhesive sourced from Norland Products), which is a high-performance adhesive compliant to Specification MIL-A-3920, featuring great bonding strength, high heat resistance, and excellent clarity to support optical applications under various operation conditions. Shalom EO only applies the adhesive outside the clear aperture of the waveplates. Waveplates made from Quartz (wavelength range 200-2000nm), or Magnesium Fluoride (MgF2) (Wavelength range 190-7000nm) are available at competitive prices.

Common Specifications:

Material	Quartz	Wavelength Range	190-7000mm
Dimension Tolerance	±0.1mm	Surface Quality	20/10 S/D
Parallelism	<1 arc sec	Retardation Tolerance	< λ/500
Clear Aperture	>90%	Damage Threshold	>500 MW/cm2
Coating	AR coating	Mount	Black Anodized Aluminium

Features:

- Cemented by NOA61
- AR Coated, R<0.2%
- Better Temperature Band width
- Wide Wavelength Bandwidth

Modules or Types:

Standard Wavelength:

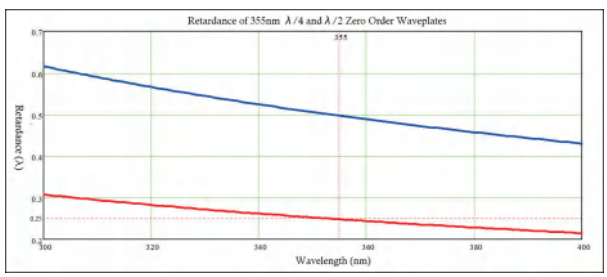
355nm, 532nm, 632.8nm, 780nm, 808nm, 850nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm

Zero Order Waveplates-Cemented by NOA61		
Quarter Waveplates P/N #	Half Waveplates P/N #	Diameter (mm)
WPC410	WPC210	10
WPC412	WPC212	12.7
WPC415	WPC215	15
WPC420	WPC220	20
WPC425	WPC225	25
WPC430	WPC230	30

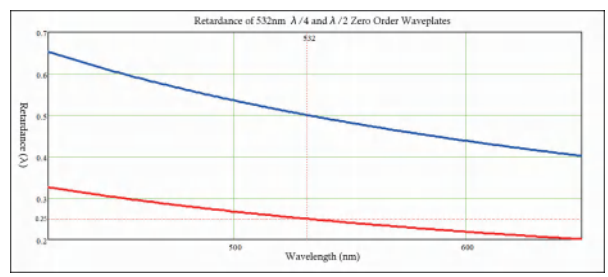
Retardation Curves:

The following graphs illustrate the retardation of Zero Order Waveplates over the wavelength ranges

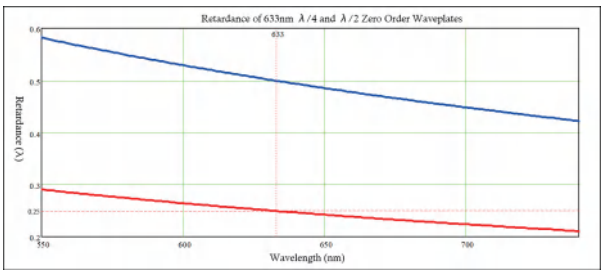
1. 355nm Zero Order Half Waveplates and Quarter Waveplates



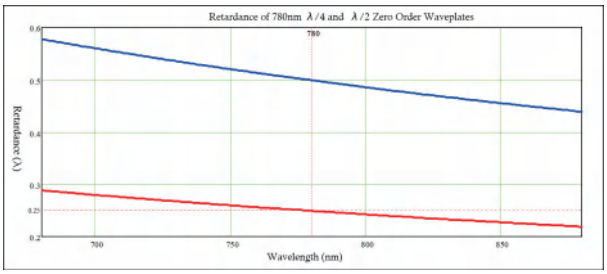
2. 532nm Zero Order Half Waveplates and Quarter Waveplates



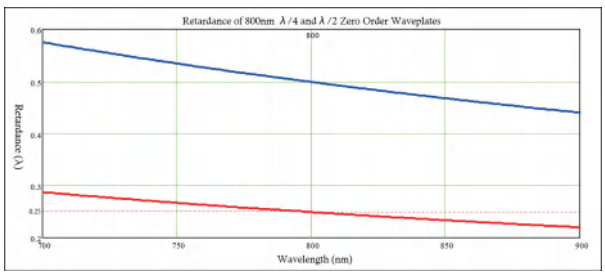
3. 633nm Zero Order Half Waveplates and Quarter Waveplates



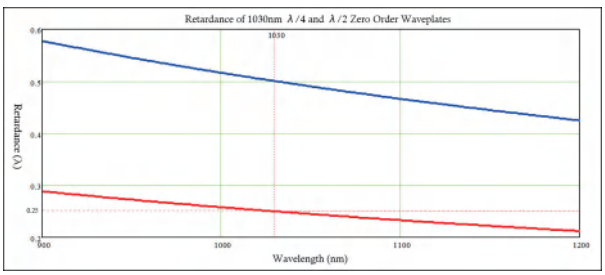
4. 780nm Zero Order Half Waveplates and Quarter Waveplates



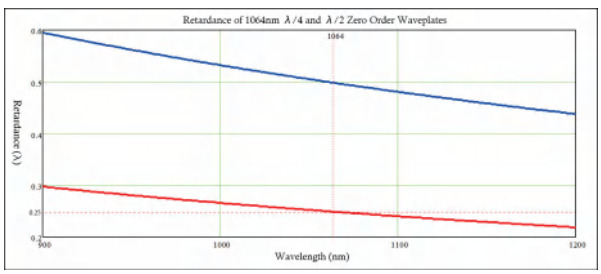
5. 800nm Zero Order Half Waveplates and Quarter Waveplates



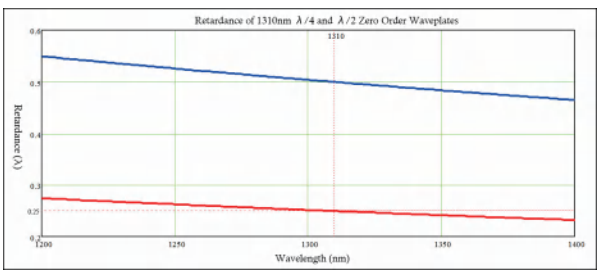
6. 1030nm Zero Order Half Waveplates and Quarter Waveplates



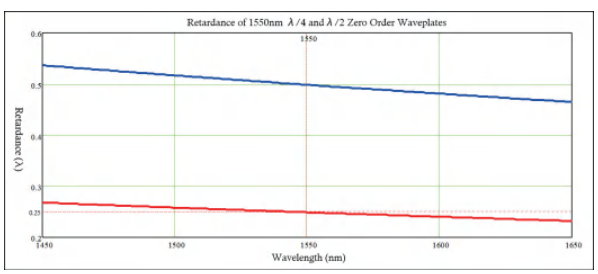
7. 1064nm Zero Order Half Waveplates and Quarter Waveplates



8. 1310nm Zero Order Half Waveplates and Quarter Waveplates



9. 1550nm Zero Order Half Waveplates and Quarter Waveplates



Dual Wavelength Waveplates



- Made of high-quality quartz crystals
- Low-order or zero-order retardation
- High damage threshold and AR-coated surfaces
- A variety of dual-wavelength-sets: 780/390nm, 800/400nm, 810/405nm, 1030/515m, 1064/532nm, 1550/775nm
- Triple Wavelength Waveplates also offered
- Customized retardation length for selection

Dual Wavelength Waveplates or retarders are a kind of Multiple Wavelength Waveplates that provide different retardations at two individual wavelengths in applications for dual-wavelength light sources. The working principle of this type of waveplate is to obtain the required phase retardation according to the fitting of the refractive index at different wavelengths. Dual Wavelength Waveplates are particularly useful when used in conjunction with other polarization-sensitive components to separate coaxial laser beams of different wavelengths or elevate and promote the conversion efficiency of Solid State SHG Lasers.

Hangzhou Shalom EO offers Multiple wavelength waveplates (majorly Dual Wavelength Waveplates, also including Triple Wavelength Waveplates) with high damage thresholds. The Waveplates are of single plate structure and introduce low-order retardation, but if you have specific requirements for zero-order dual/triple wavelength waveplates, we might arrange it for you.

Specifications:

Material	Quartz	Wavelength Sets	780/390nm, 800/400nm, 810/405nm, 1030/515m, 1064/532nm, 1550/775nm (Dual Wavelengths), Triple Wavelengths
Aperture	18mm	Surface Quality	20/10 S/D
Parallelism	<1 arc Sec	Retardation Tolerance	Depending on the application wavelengths
Damage Threshold	>500 MW/cm2	Coating	AR coating
Mounted Diameter	25.4mm (1inch)		

Product List of Dual Wavelength Waveplates

Code	Retardation	Aperture	Mount	Unit Price
2082-001	λ/2@1030+λ@515	18mm	Diameter 25.4mm (1")	$205.0
2082-002	λ/2@800+λ@400	18mm	Diameter 25.4mm (1")	$205.0

True Zero Order Waveplates



- Stable retardance over certain spectral and temperature range
- Structure: Ultra-thin free-standing single plate or constructed with substrates
- Wide acceptance angle and accurate retardations
- High damage threshold 1GW/cm2 (single plate versions)
- Two types of materials: Quartz for routine wavelengths, and MgF2 for >3000nm applications

True zero order waveplate is an advanced and improved version of zero order waveplates with superior broadband performance. Although belonging to the zero-order category, unlike the net zero-order waveplates which generate the desired retardance by stacking two multiple-order waveplates and get the resulting retardation from the difference of phase shifts in the two plates, true zero-order waveplates feature extremely miniature thickness to provide exactly the required retardation (for example, a phase delay of precisely lambda/2 for a half waveplate). This feature bestows excellent retardation consistencies corresponding to wavelength change, ambient temperature change, and changes in incident angle on true zero-order waveplates.

The most prevalent waveplates are half waveplates and quarter waveplates, half waveplates are frequently used to rotate vertical polarization to horizontal polarization while quarter waveplates are used for conversions between linear polarization and circular polarization Hangzhou Shalom EO offers multiple specifications of true zero order waveplates with half or quarter retardance, including three kinds: Quartz free-standing single plate, Quartz single plate + BK7 substrate, and MgF2 true zero order waveplates.

Specifications:

Material	Quartz	Wavelength Range	532-7000nm
Dimension Tolerance	±0.1mm	Surface Quality	20 / 10 S/D
Parallelism	<1 arc Sec	Retardation Tolerance	λ/60-λ/200(λ<400nm)， λ/200-λ/500(400nm<λ<700nm)， λ/500-λ/600(λ>700nm)
Clear Aperture	>90%	Damage Threshold	>1 GW/cm^2 (Single Plate), 1-2J/cm^2 (Cemented) 15J/cm^2 (Diffusion Bonded)
Coating	AR coating	Mounted Diameter	25.4mm (1 inch)

Modules or Types:

Type1: True Zero Order Waveplate-Single Plate

This type of zero order waveplate is designed for high damage threshold application (more than 1GW/cm2). However the extremely small thickness of the plate also imply that it might be susceptible to fracture and injury during operation.

Features:

- Wide Angle Acceptance
- Better Temperature Bandwidth
- Wide Wavelength Bandwidth
- High Damage Threshold
- AR Coated, R<0.2%
- Single Plate

Standard Wavelengths:

λ/2：1310nm, 1480nm, 1550nm

λ/4：980nm, 1064nm，1310nm, 1480nm, 1550nm

Common Specifications:

True Zero Order Waveplate-Single Plate		
Quarter Waveplates P/N #	Half Waveplates P/N #	Diameter (mm)
WPS410	WPS210	10
WPS412	WPS212	12.7
WPS415	WPS215	15
WPS420	WPS220	20
WPS425	WPS225	25
WPS430	WPS230	30

Type 2: Zero Order Waveplate-Cemented

This type of zero order waveplate is constructed of a true zero order waveplate and a BK7 substrate. As the waveplate is very thin and easy to be damaged,the BK7 plate's function is to strengthen the waveplate. The modules cemented with BK7 substrates have the drawback of significantly reduced damage threshold (1~2J/cm2@1064nm,10ns,10Hz). The BK7 substrates might also be assembled together with the quartz plates by a glue-free method of diffusion bonding, which subsequently raise the damage threshold to 15J/cm2@1064nm,10ns,10Hz.

Features:

- Standard Thickness:1.1±0.2mm
- Cemented by NOA61 (Norland Optical Adhesive 61)
- Wide Angle Acceptance
- Better Temperature Bandwidth
- Wide Wavelength Bandwidth
- AR coating, R<0.2%

Standard wavelengths:

532nm, 632.8nm, 780nm, 808nm， 980nm, 1064nm， 1310nm, 1480nm, 1550nm

Common Specifications:

True Zero Order Waveplate-Cemented		
Quarter Waveplates P/N #	Half Waveplates P/N #	Diameter (mm)
WPF410	WPF210	10
WPF412	WPF212	12.7
WPF415	WPF215	15
WPF420	WPF220	20
WPF425	WPF225	25
WPF430	WPF230	30

Achromatic Waveplates



- Off-the-shelf and customized modules available
- Flat retardance over a certain wavelength range
- Two materials: Quartz and MgF2
- Wavelength band options: 450-650nm, 690-1200nm, and 900-2000nm
- NOA61 cemented or Air spaced structure
- Super Achromatic Waveplates with broader wavelength range are also offered in Shalom EO

An Achromatic Waveplate is a special kind of Zero Order waveplate, comprised of two waveplates made of two different birefringent materials (e.g., crystal quartz and magnesium fluoride). The existence of chromatic dispersion greatly affects the refractive indices of materials. The two birefringent materials which construct the achromatic waveplates have complementary birefringent properties that could attenuate the chromatic dispersion effects so that excessive shifts of retardation over wavelength change in the first waveplate could be counterbalanced by the second waveplate. This results in a virtually flat response of phase delay over a broad wavelength band (usually hundreds of nanometers), therefore achromatic waveplate is an excellent choice for applications such as tunable laser sources, femtosecond laser systems, spectroscopy, and other systems concerning broadband light sources.

The two most common phase retardation values are lambda/2 and lambda/4 retardation, half waveplates could be applied to transform vertical polarization into horizontal polarization and vice versa, while quarter waveplates could be used for the conversion of linear and circular polarization.

Shalom EO offers Achromatic Half Waveplates and Achromatic Quarter Waveplates with AR coatings. The two constituent plates, one made of single-crystal quartz , one made of magnesium fluoride (MgF2), are either cemented together using NOA61 (Norland Optical Adhesive 61, an optical grade adhesive) or with an architecture of an air gap in between. NOA61 is a high-performance adhesive with great bonding strength, high heat resistance, and excellent clarity to support optical applications under various operation conditions, and Shalom EO only applies the glue outside the clear aperture of the waveplates. Achromatic waveplates with an air-spaced design are coated on all faces, then mounted on opposite sides of a spacer, and placed within a cell, to form an air gap between the quartz waveplate and the MgF2 waveplate. The air-spaced modules have particularly promoted damage threshold greater than 500 MW/cm^2, and are adaptive to high power lasers.

Off-the-shelf achromatic waveplates are available for online shopping in Shalom EO. The standard achromatic waveplates are of half or quarter retardation, with three optional wavelength ranges: 450-650nm, 690-1200nm, and 900-2000nm covering the visible, and a portion of the infrared Spectral. Fast dispatch and economized pricing are guaranteed. if you have any other specific requirements, Shalom EO also provides custom services where all the parameters can be tailored to suit your demand.

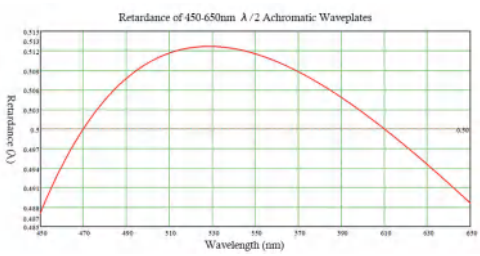
Specifications:

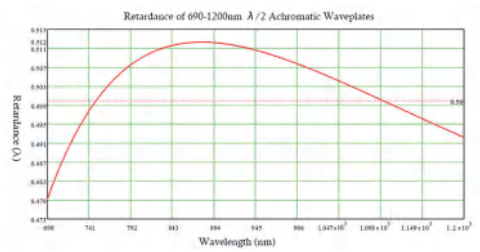
Material	Quartz+MgF2	Wavelength (Standard)	450-650nm 690-1200nm 900-2000nm
Retardation	λ/4 or λ/2	Aperture	18mm
Surface Quality	20/10 S/D	Parallelism	<1 arc Sec
Retardation Tolerance	< λ/100	Damage Threshold	>500 MW/cm^2
Coating	AR coating	Mounted Diameter	25.4mm (1 inch)

Retardation Curves:

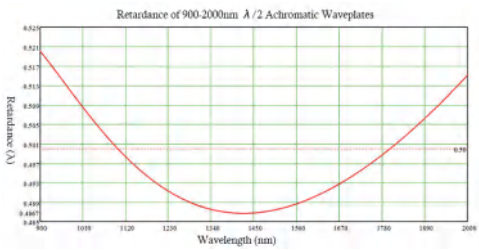
The following graphs illustrate the retardation of Achromatic Waveplates over the wavelength ranges

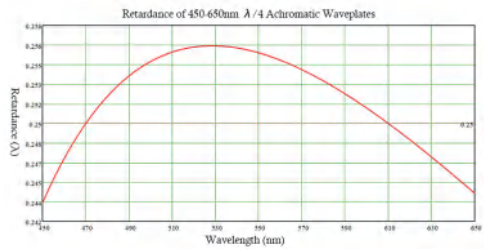
1. 450-650nm Achromatic Quarter Waveplates and Half Waveplates



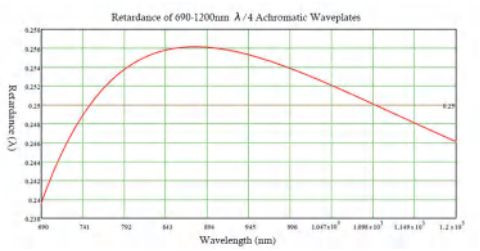


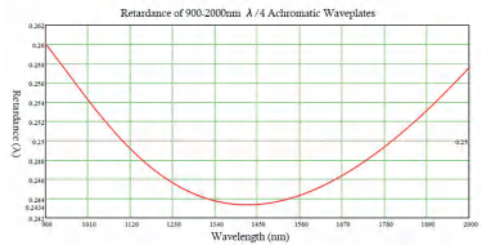
2. 690-1200nm Achromatic Quarter Waveplates and Half Waveplates





3. 900-2000nm Achromatic Quarter Waveplates and Half Waveplates





Product List of Achromatic Waveplates

Code	Wavelength	Retardation	Aperture	Mount	Unit Price
2081-001	450-650nm	λ/4	18mm	Diameter 25.4mm (1")	$280.0
2081-002	450-650nm	λ/2	18mm	Diameter 25.4mm (1")	$280.0
2081-007	650-950nm	λ/4	18mm	Diameter 25.4mm (1")	$280.0
2081-008	650-950nm	λ/2	18mm	Diameter 25.4mm (1")	$280.0
2081-003	690-1200nm	λ/4	18mm	Diameter 25.4mm (1")	$280.0
2081-004	690-1200nm	λ/2	18mm	Diameter 25.4mm (1")	$280.0
2081-005	900-2000nm	λ/4	18mm	Diameter 25.4mm (1")	$280.0
2081-006	900-2000nm	λ/2	18mm	Diameter 25.4mm (1")	$280.0

Super Achromatic Waveplates



- Exceedingly flat retardation over a broad wavelength range
- Wavelength range: 325-1100nm and 600-2700nm (quarter waveplate), 310-1100nm and 600-2700nm (half waveplate), or custom wavelength range
- Cemented construction (NOA61 cemented)
- 25.4mm (1 inch) mounter configured
- AR coatings on the surfaces

Super Achromatic Waveplates are the high-performance version of Achromatic Waveplates with superior broadband functions, consisting of three Quartz single plates and three Magnesium Fluoride (MgF2) single plates. The working principle of super achromatic waveplates is the same as that of normal achromatic waveplates: Through aligning the fast axes and slow axes of the constituent waveplates made from two birefringent materials, of which the changes in the birefringent indices (against wavelength) are complementary, the sensitivity of retardation to wavelength is significantly reduced. Stacking up six constituent plates, Shalom EO develops zero-order super achromatic waveplates with excellence that generate exceedingly flat retardation over a broad wavelength range and drastically reduce the effects of external factors, therefore are of exception reliability under various operating conditions. Super Achromatic Waveplates are a kind of broadband waveplates for applications across the ultra-violent spectral to the MWIR spectral. As for LWIR applications, the Fresnel Rhomb Retarders are more recommendable (maximum wavelength range 2000-15000 nm).

The most widely applied waveplates are Half Waveplates and Quarter Waveplates. Hangzhou Shalom EO offers standard versions of a quarter or half retardance super achromatic waveplates with three standard wavelength ranges from the Ultraviolet to the Infrared spectral: 325-1100 nm and 600-2700 nm (for quarter waveplates), or 310-1100 nm and 600-2700 nm (for half waveplates). The waveplates adopt a cemented structure, the six composing plates are cemented using NOA61 (Norland Optical Adhesive 61), an optical grade solid adhesive compliant to the Federal Specification MIL-A-3920, which is solvent-resistant and extremely temperature-durable and is oriented for the best performance of these super achromatic waveplates. The surfaces of the plates are AR coated to ensure high transmission and low power loss of the system. If you require other wavelength ranges, contact our tech support and Shalom EO could arrange the custom service for you.

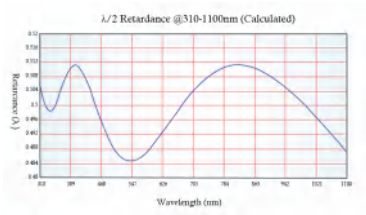
Specifications:

Wavelength Ranges:	325-1100nm and 600-2700nm (quarter wave plate), 310-1100nm and 600-2700nm (half waveplate)
Surface Quality	20/10 S/D
Parallelism	<1 arc sec
Wavefront Distortion	<λ/10@633nm
Damage Threshold	0.5 J/cm^2 (1064 nm, 10 ns, 10 Hz, Ø1 mm)
Coating	AR coating
Mounter	25.4mm (1 inch) Anodized Alumimium Mounter

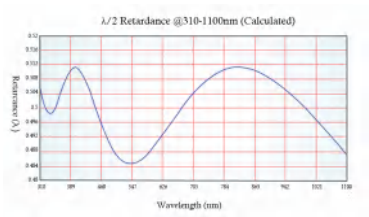
Retardation Curves:

The following graphs illustrate the retardation of Super Achromatic Waveplates over the wavelength ranges

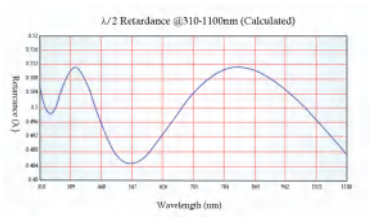
1. 310-1100nm Super Achromatic Quarter Waveplates



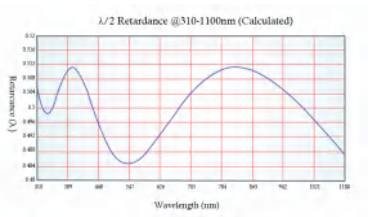
2. 310-1100nm Super Achromatic Half Waveplates



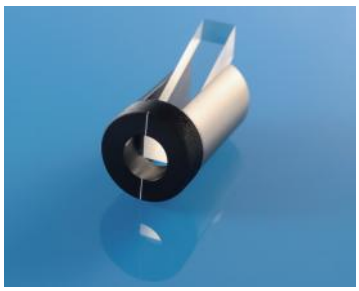
3. 600-2700nm Super Achromatic Quarter Waveplates



4. 600-2700nm Super Achromatic Half Waveplates



Fresnel Rhomb Retarders



- Quarter-wave or half-wave retardance
- Broader wavelength bandwidth than common waveplates (Maximum 2000-15000nm)
- Three materials optional: BK7, UV Fused Silica, and ZnSe
- Half-wave prisms constructed by two quarter-wave prisms cemented together
- Both stocked and custom modules are available

A Fresnel Rhomb Retarder is a special kind of optical retarder that produces a phase delay of λ/2 or λ/4 by utilizing internal reflection. Unlike conventional waveplates which function through the birefringence of materials to produce the required phase difference between the two orthogonal polarizations, the Fresnel Rhombs are made of non-birefringent materials and induce the desired phase delay after going through two total reflections. The retardation produced by a Fresnel rhomb depends almost solely on the refractive index and the geometries of the prism, and since the refractive index varies just slightly against a certain wavelength range, the independence of retardation over the wavelength changes is much greater, thus achieving extraordinarily flat retardation throughout a broad wavelength range, which could have been impossible in the case of broadband waveplates made of birefringent materials. This kind of broadband retarder is suitable for applications in diode and fiber applications, broadband, multi-line, or tunable laser sources.

The Fresnel Rhomb Retarder is usually shaped into a right parallelepiped, that is, a right parallelogram-based prism. The angles of the parallelograms are deliberately designed so that each reflection inside the rhomb, with the incident angles carefully chosen, adds a phase difference of precisely 1/8 wavelength between the two orthogonal polarization components, and ultimately resulting in a total phase delay of a quarter of a wavelength in the exiting light. Two quarter-retarders could be cemented together to achieve the effect of using a half-waveplate. The variation in retardance is within 2% across the wavelength range. The Fresnel Rhombs are good substitutes for broadband waveplates and UV waveplates, with extended wavelength bandwidth (broader than the Achromatic Waveplates) from the Ultraviolet to the IR wavelength spectral.

Hangzhou Shalom EO offers Fresnel Rhomb Retarder with either λ/2 or λ/4 retardance, for Ultraviolet, Visible, and LWIR applications. The Fresnel Rhomb Retarders made of BK7 operating at the wavelength range of 350-2300nm, UV Fused Silica (wavelength range 210-400nm), and ZnSe (wavelength range 2000-15000nm) are procurable. Off-the-shelf products for online shopping are listed in the catalog, while custom products can be provided upon request.

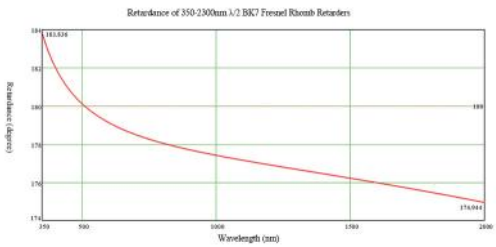
Specifications:

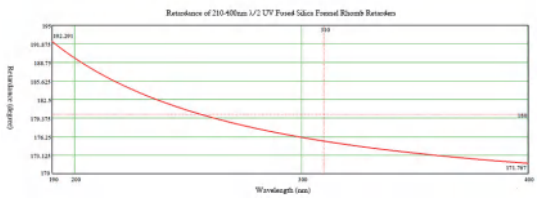
Material	UV Fused Silica/BK7/ZnSe	Aperture Diameter	10.0mm
Wavelength Range	210-400nm (UV Fused Silica), 350-2300nm (BK7), 2000-15000nm (ZnSe)	Retardation	λ/2 or λ/4
Retardation Tolerance	+/-2°	Flatness	λ/10@632.8nm (UV Fused Silica), λ/10@632.8nm (BK7), λ/4@632.8nm (ZnSe)
Surface Quality	20/10 S/D (UV Fused Silica), 20/10 S/D (BK7), 40/10 S/D (ZnSe)	Broad band AR Coating	R<1%@600-900nm
Mount	Mounted		

Retardation Curves:

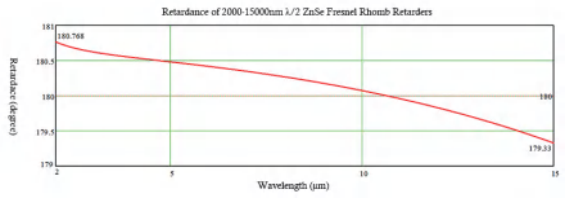
The following graphs illustrate the retardation of Fresnel Rhomb Retarders over the wavelength ranges.

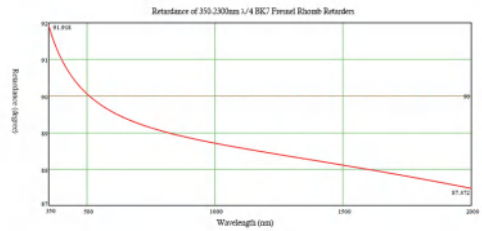
1. 210-400nm Fresnel Rhomb Retarders of UV Fused Silica (λ/2 and λ/4 retardance)



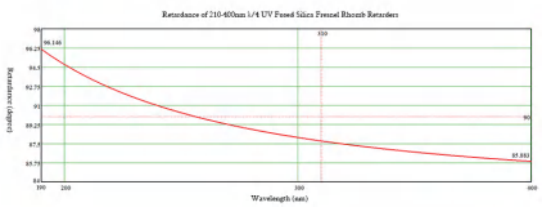


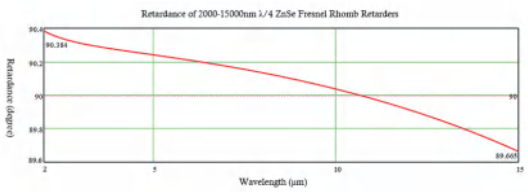
2. 350-2300nm Fresnel Rhomb Retarders of BK7 (λ/2 and λ/4 retardance)





3. 2000-15000nm Fresnel Rhomb Retarders of ZnSe (λ/2 and λ/4 retardance)





Product List of Fresnel Rhomb Retarders

Code	Material	Wavelength	Retardation	Aperture	Mount	Unit Price
20709-001	UV Fused Silica	210-400nm	λ/2	10mm	Mounted	Inquire
20709-002	UV Fused Silica	210-400nm	λ/4	10mm	Mounted	Inquire
20709-003	BK7	350-2300nm	λ/2	10mm	Mounted	Inquire
20709-004	BK7	350-2300nm	λ/4	10mm	Mounted	Inquire
20709-005	ZnSe	2000-15000nm	λ/2	10mm	Mounted	Inquire
20709-006	ZnSe	2000-15000nm	λ/4	10mm	Mounted	Inquire

Low Order Waveplates



- Low cost and fast delivery
- AR coated and high damage threshold
- Wavelength options: from 266nm to 7000nm
- Two material options: Quartz or MgF2 Waveplates
- Low Order Dual Wavelength Waveplates are also available.

Low-order waveplates are a kind of multiple-order waveplates but with improved optical characteristics. Low-order waveplates usually generate the desired phase delay with a surplus of several full wavelength phase shifts (the terminology "order" here indicates the number of additional wavelength shifts). Compared to common multiple-order waveplates, which produce a high number of excessive full wavelength shifts, low-order waveplates are thinner and less dependent upon wavelengths, ambient temperature, and the angle of incidence. While in contrast with zero-order waveplates, low-order waveplates excel at a more competitive price, although having relatively lower retardation stability.

Hangzhou Shalom EO provides Low Order Half Waveplates (suggested for rotation of the polarization plane) and Low Order Quarter Waveplates (for conversion between linear polarization and circular polarization) of single plate structures, made from Quartz or Magnesium Fluoride (MgF2). Quartz Low Order Waveplates could be applied for quarter or half-wave retardations for wavelengths ranging from the UV to the NWIR spectral. MgF2 Waveplates could be applied for quarter or half wave retardations for wavelengths up to the MWIR (maximum 7000nm) region. If you are seeking solutions for large-scale and low-cost production, Our Low-Order Waveplates are just right for you. Standard and customized Low Order Waveplates are available in Shalom EO with fast delivery and low price.

Low Order Dual Wavelength Waveplates which could support double retardation operations for dual-wavelength sets are available in Shalom EO as well.

The simple but robust single waveplate structure of Shalom EO's Low Order Waveplates contributes to a high damage threshold greater than 500MW/cm^2. The surfaces are coated with AR coatings, configured by Black Anodized mountings.

Specifications:

Material	Quartz or MgF2	Wavelength Range	266-7000nm
Dimension Tolerance	+/-0.1mm	Surface Quality	20 / 10 S/D
Parallelism	<1 arc Sec	Retardation Tolerance	λ/60-λ/100(λ<400nm), λ/100-λ/200(400nm<λ<700nm), λ/200-λ/500(λ>700nm)
Clear Aperture	>90%	Damage Threshold	500 MW/cm2
Coating	AR coating	Mount	Black Anodized Aluminium

Modules or Types:

Standard Wavelength:

266nm, 355nm, 532nm, 632.8nm, 780nm, 808nm, 850nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm.

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter (mm)
WPL410	WPL210	10
WPL412	WPL212	12.7
WPL415	WPL215	15
WPL420	WPL220	20
WPL425	WPL225	25
WPL430	WPL230	30

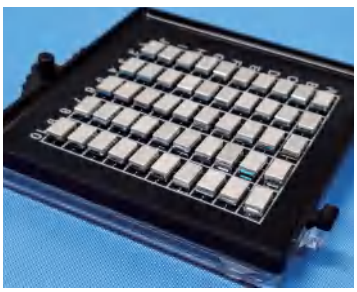
MgO:PPLN Crystal Series



Periodically Poled Lithium Niobate (PPLN) Crystal is a type of non-linear optical crystal with distinguished high conversion efficiencies and a wide transparent spectrum of 0.4-5μm, the periodic domain structures of the PPLN crystals are patterned through a process of electric filed poling. The 5% MgO doping in LiNbO3 improves the damage threshold of the PPLN to a significant extent and broadens its phase-matching bandwidth. MgO: PPLN crystals exhibit a unique quasi-phase-matching (QPM) phenomenon, enabling the utilization of a higher nonlinear coefficient, other important merits of QPM also include convenient temperature environment and the absence of spatial walk-off. through precise engineering of the crystal's domain structure. An optical waveguide is an inhomogeneous structure for guiding light, i.e. for restricting the spatial region in which light can propagate.

Shalom EO offers standard and custom MgO:PPLN bulk crystal chips, MgO:PPLN waveguides, mGreen Modules, and MgO:PPLN laser modules. Our MgO:PPLN crystals and waveguides feature high damage threshold, exceptional optical transmittance, and thermal conductivity, rendering them robust candidates for high power applications and various frequency conversion processes including SHG/SFG/DFG/OPA/OPG/OPO. The wavelength range spans from visible to mid-IR, and the QPM structure can be selected. Shalom EO also supplies mGreen modules producing 532nm and 561nm green light. Besides, We provide MgO:PPLN laser modules of 473nm, 532nm,545nm, 561nm, and 671nm wavelengths.

mGreen Modules



- Off-the-shelf and custom mGreen modules are available
- High Output Power and high conversion efficiencies
- Miniature size and suitable for compact Lasers
- Allows for easy integration

Shalom EO offers off-the-shelf and custom mGreen modules. The MgO:PPLN crystals incorporated inside the green are used as the frequency conversion element, which converts the 1064nm Nd:YAG laser pumped using an 808nm LD to 532nm green output through SHG. Besides, 561nm laser output can be obtained from SHG of 1122nm Nd:YVO4 laser. The PPLN crystal and the Nd:YAG/Nd:YVO4 crystal are assembled with a copper heat sink. Our mGreen modules feature compact dimensional design, high output power, high conversion efficiencies, and allow convenient integration. With the combination of excellence, Shalom EO's mGreen modules serve as indispensable components for your laser systems.

Specifications:

Wavelength Range	532nm, 561nm	Dimension	7.0x2x4.5mm, 5.5x2x4.5mm
Output power	200-1500mW	Temperature Stabilizing	TEC

Product List of mGreen Modules

Code	Wavelength	Dimension	Output Power	Temperature Stabilizing	Unit Price
2092-001	532nm	7.0x2x4.5mm	100-400mW	TEC	Inquire
2092-002	532nm	7.0x2x4.5mm	500-1000mW	TEC	Inquire
2092-003	532nm	7.0x2x4.5mm	1000-1500mW	TEC	Inquire
2092-004	561nm	5.5x2x4.5mm	200-300mW	TEC	Inquire

MgO:PPLN Crystals and Waveguides



- Stocked and custom crystals available
- High conversion efficiencies
- Wide output wavelength range
- Miniature size, suitable for compact lasers
- Ideal for various functions: SHG, DFG, SFG, OPO, and OPA

Periodically Poled Lithium Niobate (PPLN) Crystal is a type of non-linear optical crystal with distinguished high conversion efficiencies and a wide transparent spectrum of 0.4-5μm. The 5% MgO doping in LiNbO3 improves the damage threshold of the PPLN to a significant extent and broadens its phase-matching bandwidth. MgO: PPLN crystals exhibit a unique quasi-phase-matching (QPM) phenomenon, which allows the utilization of a higher nonlinear coefficient than in the case of birefringent phase matching. Other important merits of QPM also include convenient temperature environment, the absence of spatial walk-off, and the attenuated possibility of photorefractive issues.

Hangzhou Shalom EO offers a series of standard and custom MgO:PPLN crystal chips and MgO:PPLN waveguides. Standard input wavelengths include 976nm, 1029nm,1064nm, 1545nm, 1550nm, 1560nm, 2100nm, etc. to deliver an output wavelength coverage ranging from the visible to mid-infrared spectral region, whereas other custom wavelengths are also available. With unparalleled advantages of high conversion efficiencies, high damage threshold, exceptional optical transmittance, and thermal characteristics, our MgO:PPLN crystals and waveguides are attractive candidates for various frequency conversion processes including up-conversion (SHG/SFG) and down-conversion (DFG/OPA/OPG/OPO), being able to withstand high power intensities. Besides, miscellaneous QPM structures are all procurable in Shalom EO.

Specifications:

Tolerance of Size	(Width±0.1mm) x (Thickness±0.05mm) x(Length±0.1mm)	Flatness	< Lambda/8 @ 633nm
Wavefront Distortion	< Lambda/6 @ 633nm	Chips	<0.1mm
Surface Quality	20/10 S/D	Parallelism	<10″
Perpendicularity	<10′		

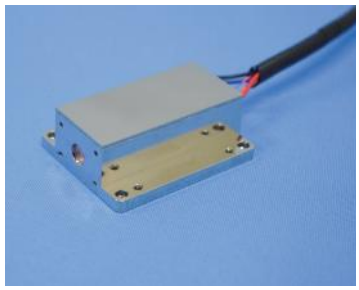
Chemical and Optical Properties:

Melting Point	1255+/-5℃	Curie Point/Temperature	1140+/-5℃
Mohs Hardness	5	Density	4.648(5)g/cm3
Thermal Conductivity	38W/m/K @ 25℃	Coefficient of Thermal Expansion	//a, 2.0x10-6/K //c, 2.2x10-6/K
Wavelength Range of Transmission	420nm ~ 5200nm	Nonlinear Coefficient	d33 = 34.4 pm/V d31 = d15 = 5.95 pm/V d22 = 3.07 pm/V
Optical Damaging Threshold	0.3GW/cm2	Absorptive Coefficient	0.004/cm @ 1064nm

MgO:PPLN Waveguide Series

Code	Material	Aperture	Thickness	Length	Coating	Application	Unit Price
2091-001	MgO:PPLN 5mol% bulk	2.0x0.5mm	0.5mm	3mm	AR/AR	SHG 1029nm	Inquire
2091-002	MgO:PPLN 5mol% bulk	2.2x0.5mm	0.5mm	1.4mm	AR/AR	SHG 1064nm	$88
2091-003	MgO:PPLN 5mol% bulk	2.2x0.5mm	0.5mm	3mm	AR/AR	SHG 1064nm	Inquire
2091-004	MgO:PPLN 5mol% bulk	2.2x0.5mm	0.5mm	10mm	AR/AR	SHG 1064nm	Inquire
2091-005	MgO:PPLN 5mol% bulk	3.0x1mm	1mm	20mm	AR/AR	SHG 1550nm	Inquire
2091-006	MgO:PPLN 5mol% bulk	2.1x0.5mm	0.5mm	15mm	AR/AR	SHG 976nm	Inquire
2091-007	MgO:PPLN 5mol% bulk	2.0x0.5mm	0.5mm	1mm	AR/AR	SHG 1029nm	Inquire
2091-008	MgO:PPLN 5mol% bulk	2.0x0.5mm	0.5mm	2mm	AR/AR	SHG 1029nm	Inquire
2091-009	MgO:PPLN 5mol% bulk	2.0x0.5mm	0.5mm	5mm	AR/AR	SHG 1029nm	Inquire
2091-010	MgO:PPLN 5mol% bulk	2.0x0.5mm	0.5mm	10mm	AR/AR	SHG 1029nm	Inquire
2091-012	MgO:PPLN 5mol% bulk	2.2x0.5mm	0.5mm	20mm	AR/AR	SHG 1064nm	Inquire
2091-013	MgO:PPLN 5mol% bulk	2.2x0.5mm	0.5mm	25mm	AR/AR	SHG 1064nm	Inquire
2091-014	MgO:PPLN 5mol% bulk	2.2x0.5mm	0.5mm	30mm	AR/AR	SHG 1064nm	Inquire
2091-015	MgO:PPLN 5mol% bulk	2.0x1mm	1mm	50mm	AR/AR	SHG 1545nm	Inquire
2091-016	MgO:PPLN 5mol% bulk	3.0x1mm	1mm	50mm	AR/AR	SHG 1545nm	Inquire
2091-017	MgO:PPLN 5mol% bulk	2.0x1mm	1mm	3mm	AR/AR	SHG 1550nm	Inquire
2091-018	MgO:PPLN 5mol% bulk	3.0x1mm	1mm	40mm	AR/AR	SHG 1560nm	Inquire
2091-019	MgO:PPLN 5mol% bulk	3.0x1mm	1mm	50mm	AR/AR	SHG 1560nm	Inquire
2091-020	MgO:PPLN 5mol% bulk	10.0x1mm	1mm	1mm	AR/AR	SHG 1560nm	Inquire
2091-021	MgO:PPLN 5mol% bulk	6.0x1mm	1mm	0.5mm	AR/AR	FS 1560nm	Inquire
2091-022	MgO:PPLN 5mol% bulk	6.0x1mm	1mm	1mm	AR/AR	FS 1560nm	Inquire
2091-023	MgO:PPLN 5mol% bulk	9.3x1mm	1mm	1mm	AR/AR	FS 2100nm	Inquire
2091-024	MgO:PPLN 5mol% bulk	9.3x1mm	1mm	5mm	AR/AR	FS 2100nm	Inquire
2091-025	MgO:PPLN 5mol% bulk	7.5x1mm	1mm	0.5mm	AR/AR	SFG	Inquire
2091-026	MgO:PPLN 5mol% bulk	7.5x1mm	1mm	1mm	AR/AR	SFG	Inquire
2091-027	MgO:PPLN 5mol% bulk	7.5x1mm	1mm	5mm	AR/AR	SFG	Inquire
2091-028	MgO:PPLN 5mol% bulk	7.5x1mm	1mm	10mm	AR/AR	SFG	Inquire
2091-029	MgO:PPLN 5mol% bulk	7.5x1mm	1mm	25mm	AR/AR	SFG	Inquire
2091-030	MgO:PPLN 5mol% bulk	7.5x1mm	1mm	50mm	AR/AR	SFG	Inquire
2091-031	MgO:PPLN 5mol% bulk	2.0x1mm	1mm	40mm	AR/AR	DFG	Inquire
2091-032	MgO:PPLN 5mol% bulk	2.0x1mm	1mm	50mm	AR/AR	DFG	Inquire
2091-033	MgO:PPLN 5mol% bulk	3.0x1mm	1mm	50mm	AR/AR	OPO	Inquire
2091-034	MgO:PPLN 5mol% bulk	3.0x2mm	2mm	50mm	AR/AR	OPO	Inquire
2091-035	MgO:PPLN 5mol% bulk	4.0x1mm	1mm	47mm	AR/AR	OPO	Inquire
2091-036	MgO:PPLN 5mol% bulk	4.0x2mm	2mm	45mm	AR/AR	OPO	Inquire
2091-037	MgO:PPLN 5mol% bulk	4.0x2mm	2mm	50mm	AR/AR	OPO	Inquire
2091-038	MgO:PPLN 5mol% bulk	5.0x3mm	3mm	10mm	AR/AR	OPO	Inquire
2091-039	MgO:PPLN 5mol% bulk	5.0x3mm	3mm	20mm	AR/AR	OPO	Inquire
2091-040	MgO:PPLN 5mol% bulk	5.0x3mm	3mm	50mm	AR/AR	OPO	Inquire
2091-041	MgO:PPLN 5mol% bulk	10.0x1mm	1mm	50mm	AR/AR	OPO	Inquire

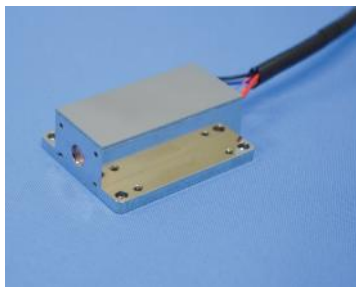
OEM Laser Modules

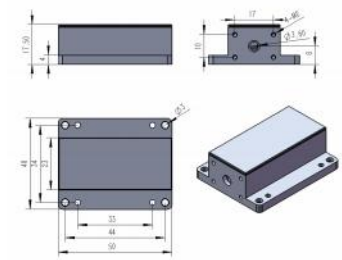


An OEM Laser Module is a separate functional module possessing a complete mechanism for generating lasers. OEM means it is produced by Original Equipment Manufacturer. OEM laser can be and is often integrated into larger machines when it comes to practical usage. The existence of OEM laser modules allows different companies to concentrate on there their own professional areas.

Hangzhou Shalom EO offers two kinds of featured OEM laser modules: eye-safe 1535nm laser modules and lasers integrated with MgO:PPLN waveguides. The pumping diodes, laser cavities, optics, and electronics are sealed in one compact housing, reducing the occupied space. The laser modules also boast ease of integration into various systems. Our OEM lasers are a harmonious fusion of excellent laser technologies and cutting-edge optomechanical engineering to obtain high output power and a desirable repetition rate.

MgO:PPLN Waveguide Laser Modules





- Stocked and custom MgO:PPLN waveguide laser modules
- Consists of MgO:PPLN waveguide integrated with the pumping LD, Nd:YVO4 or Nd:YAG, and optics
- High output power and superb conversion efficiencies
- Compact design and small size
- Convenient integration

MgO:Periodically Poled Lithium Niobate (PPLN) Waveguide Laser Modules consist of MgO:PPLN waveguide as the frequency conversion component integrated with the pumping laser diode (LD), Nd:YVO4 or Nd:YAG laser crystals and other accompanied optics. Hangzhou Shalom EO offers various off-the-shelf and custom laser modules installed with MgO:PPLN waveguides, the available standard output wavelengths include: 473nm, 532nm,545nm, 561nm, and 671nm, whilst other custom output wavelengths are also accessible upon requests.

Specifications:

Wavelength Range	473-671nm	Dimension	50x40x18mm/56x34x18mm/57x19x14mm/ 116x70x47mm
Output Power	10-1500mW	Power Stability	< ±3%@3hrs
Mode	TEM00/near TEM00	Beam Divergence	<1 mrad- < 11mrad

Product List of MgO:PPLN Waveguide Laser Modules

Code	Wavelength	Dimension	Output Power	Mode	Beam Divergence	Power stability	Unit Price
2093-001	473nm	50x40x18mm	10-150mW	TEM00	<1 mrad	< ±3%@3hrs	Inquire
2093-002	532nm	57x19x14mm	500mW	Near TEM00	< 10mrad	< ±3%@3hrs	Inquire
2093-003	532nm	56x34x18mm	1000mW	Near TEM00	< 10mrad	< ±3%@4hrs	Inquire
2093-004	532nm	56x34x18mm	1500mW	Near TEM00	< 11mrad	< ±3%@5hrs	Inquire
2093-005	532nm	56x34x18mm	4000mW	Near TEM00	< 11mrad	< ±3%@5hrs	Inquire
2093-006	532nm	116x70x47mm	200-300mW	TEM00	< 1.5mrad	< ±1%@3hrs	Inquire
2093-007	545nm	50x40x18mm	200-300mW	Near TEM00	< 10mrad	< ±3%@3hrs	Inquire
2093-008	561nm	50x40x18mm	200-300mW	Near TEM00	< 1mrad	< ±3%@4hrs	Inquire
2093-009	671nm	50x40x18mm	500-600mW	Near TEM00	< 1mrad	< ±3%@5hrs	Inquire

1535nm Eye Safe Pulsed Laser Modules



- Standard and custom Modules
- 1535nm eye-safe wavelength
- High repetition frequencies up to 1kHz
- High compatibility permitting easy integration
- Applications: laser range finder, Lidar, and medical treatment

Lasers with emission wavelengths longer than1.4μm are often called “eye-safe”, which are far less dangerous to the human eyes than 1-μm lasers with similar output powers. Shalom EO has developed the eye-safe micro laser module with a wavelength of 1535nm that is utilized in manifold applications such as laser range finder, Lidar, and medical treatment. Our 1535nm OEM laser modules have proven for proper and stable operations in extreme environments with a wide ambient temperature range of -40℃~65℃ and to tolerate violent shock and vibration conditions.

Shalom EO's 1535nm Eye-safe OEM Laser Module is composed of a single laser diode emitting 940nm output to end pump an Er,Yb:glass laser gain media (A conducive feature of Er,Yb: glass lasers is that its inherent emission wavelength is 1.54 microns, which implies the 1.54 microns laser emission can be obtained without any nonlinear interactions, which is important for eye-safe operation and low-cost fabrication), a Co2+:MgAl2O4 passive Q-switch to produce pulses of nanosecond pulse duration at a repetition rate from a single shot to 10 Hertz, which is sufficient to cover a measurement distance over 2 kilometers. The Eye-safe microlaser is designed and engineered to run over a broad temperature range without temperature control of the pump laser. Both stocked and custom 1535nm Eye-safe OEM Laser Module are available in Shalom EO.

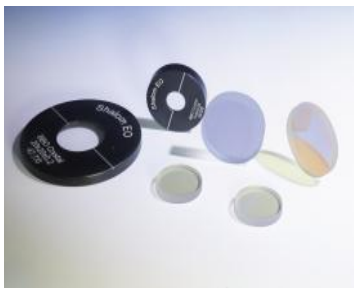
Specifications:

Peak Power	12.5-50kW	Pulse Repetition Frequency	10Hz/1000Hz
Pulse Energy Stability	<3%	Beam Divergence	12mrad
Pulse width (FWHM)	4-5ns/4-7ns/ 5-7ns	Temperature range	-40℃ -65℃

Product List of 1535nm Eye Safe Pulsed Laser Modules

Code	Pulse width (FWHM)	Peak Power	Pulse Repetition Frequency	Pulse Energy Stability	Beam Divergence	Unit Price
2101-001	4-7ns	20kW	10Hz	<3%	12mrad	Inquire
2101-002	4-7ns	40kW	10Hz	<3%	12mrad	Inquire
2101-003	5-7ns	50kW	10Hz	<3%	12mrad	Inquire
2101-004	4-5ns	10kW	1000Hz	<3%	12mrad	Inquire
2101-005	4-5ns	12.5kW	1000Hz	<3%	12mrad	Inquire

Optical Components for Femtosecond Lasers

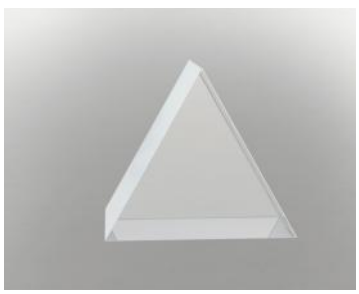


Femtosecond Laser is a kind of ultra-fast pulsed laser with a pulse duration of less than 1ps, which is in the domain of femtoseconds, such short laser pulse is often achieved through passive mode-locking techniques. Femtosecond lasers concentrate the energies on a very short time scale within a single laser pulse, enabling femtosecond lasers to achieve remarkable precision with minimal thermal damage to surrounding material. Optical components are critical for shaping, manipulating, and directing the ultra-short pulses emitted by femtosecond lasers.

Shalom EO offers a diverse range of custom and off-the-shelf optical components for femtosecond lasers, including ultrafast mirrors (Femtoline Low GDD Mirrors, Ultrafast-Enhanced Silver Mirrors) designed to minimize dispersion and aberrations over the broad spectral range of femtosecond pulses; nonlinear optical crystals (BBO Crystals, LBO Crystals) utilized for wavelength conversion; pulse diagnostics and control components (Group Velocity Delay Compensators, Dispersion Prisms) used to optimize femtosecond pulse parameters, such as pulse duration, temporal profile, and spectral content; and High Precision Thin N-BK7, UV Fused Silica Windows.

Shalom EO has industrial-leading expertise in manufacturing Optical Components for femtosecond Laser, from ultrafast optics to nonlinear optical elements, our components are designed and crafted with precision engineering to deliver superior performance across a wide range of femtosecond laser applications.

Dispersion Prisms



- Off-the-shelf and custom prisms available
- Made of BK7, UVFS and SF11
- Engineered for femtosecond lasers
- Used in Cavity to lower reflection loss

A dispersion prism is an optical component designed to disperse light into its constituent wavelengths. This dispersion arises from the principle of refraction, where light passing through the prism is bent at different angles depending on its wavelength. When monochromatic light enters a dispersion prism, it is refracted (bent) at each surface, causing different colors (wavelengths) to refract by different amounts due to their shifting wavelengths. This separation of colors results in a spectrum of light emerging from the prism.

The dispersion prisms featured on this page are to be used inside the cavity of femtosecond laser, which operates on very low gain laser transitions and even slight reflection losses might be intolerable to it, the dispersion prism serves as a component to reduce reflection loss inside the cavity of the femtosecond laser.

Common Specifications:

Materials	BK7, UV FS or SF11	Flatness	λ/4@633nm
Surface Quality	20/10 S/D	Apex Angle Tolerance	+/2 arc minutes

Product List of Dispersion Prisms

Code	Material	Side Length	Thickness	Apex Angle	Unit Price
2115-001	BK7	15mm	10mm	67°	$31.0
2115-002	BK7	25mm	20mm	67°	$40.0
2115-003	BK7	50mm	30mm	67°	$77.0
2115-004	UV FS	15mm	10mm	69°	$46.0
2115-005	UV FS	25mm	20mm	69°	$61.5
2115-006	UV FS	50mm	30mm	69°	$230.0
2115-007	SF11	15mm	10mm	59°	$54.0
2115-008	SF11	25mm	20mm	59°	$70.0
2115-009	SF11	50mm	30mm	59°	$146.0

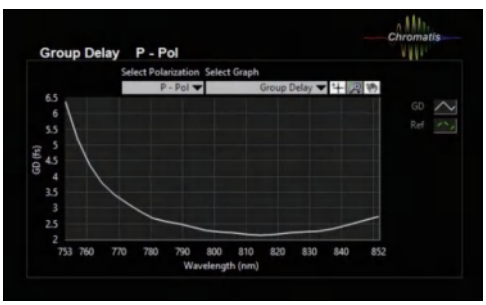
Femtoline Low GDD Mirrors



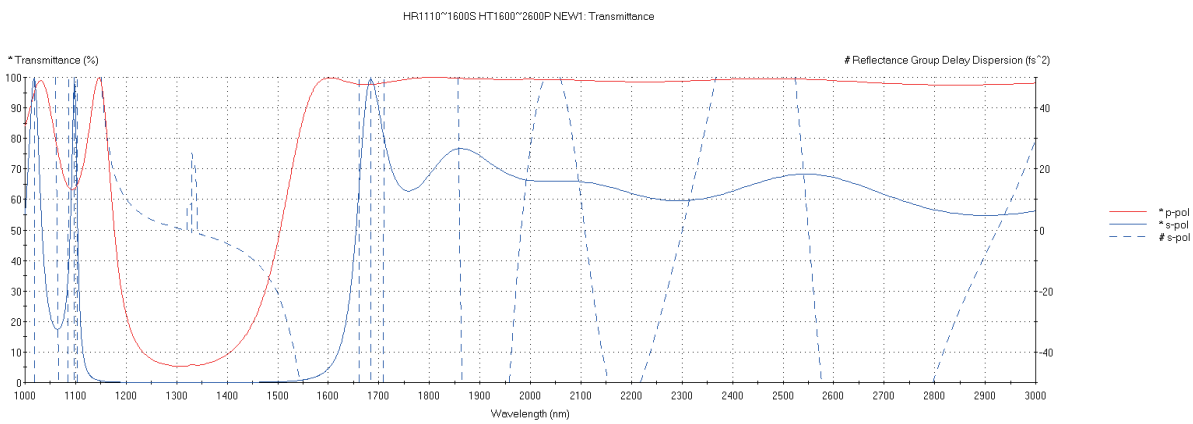
- Stocked and custom mirrors available
- Made of Corning UV grade Fused Silica
- High flatness λ/10, high surface quality:10/5 S/D
- Outstanding optical properties, mechanical robustness, and minimal thermal expansion
- Cutting-edge low Group Delay Dispersion (GDD) techniques minimal temporal dispersion of femtosecond laser pulses

Shalom EO's Femtoline Low GDD Mirrors are engineered to achieve exceptional reflection across a narrow bandwidth centered around the central wavelength of femtosecond lasers. These mirrors are coated with single-layer dielectric coating with no phase shift over the operating wavelength region using cutting-edge low Group Delay Dispersion (GDD) techniques, minimizing phase distortion and preserving the beam profile of femtosecond pulses during their propagation. The mirror substrates are crafted from Corning UV fused silica 7980 0F, a material renowned for its outstanding optical properties, mechanical robustness, and minimal thermal expansion, ensuring high performance and durability. High-precision controlling techniques are harnessed to enhance to a precision standard of λ/10 flatness and 10/5 S/D surface quality.

Hangzhou Shalom EO offers stocked Low GDD mirrors optimized for high reflection within specific wavebands or wavelengths, including 400nm, 532nm, 800nm, 808nm, 760-840nm, 1030nm, 1000-1060nm, and 1064nm, accommodating incident angles of 0 degrees and 45 degrees. In addition, customized Low GDD mirrors tailored to other reflection wavebands and wavelengths are available upon request, providing versatility to suit diverse application needs.



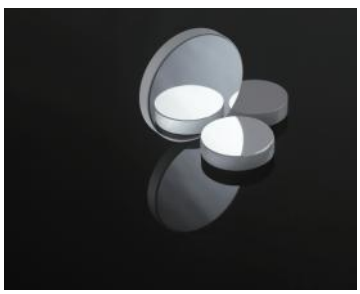
Material	Corning UV fused silica	Surface Quality	10/5 S/D
Wavelength Band	760-840nm, 1000-1060nm or custom	R,(S+P)/2	99.50%
Diameter	12.7-50.8mm	Surface Flatness	λ/10
Incident Angles	0° and 45°	Customization	available



Product List of Femtoline Low GDD Mirrors

Code	Wavelength	Diameter	Thickness	R,(S+P)/2	AOI	Unit Price
125-001	760-840nm	12.7mm	3.0mm	99.5%	0°	$45.5
125-002	760-840nm	25.4mm	6.0mm	99.5%	0°	$60.5
125-003	760-840nm	50.8mm	12.0mm	99.5%	0°	$136.5
125-004	760-840nm	12.7mm	3.0mm	99.5%	45°	$45.5
125-005	760-840nm	25.4mm	6.0mm	99.5%	45°	$60.5
125-006	760-840nm	50.8mm	12.0mm	99.5%	45°	$136.5
125-007	1000-1060nm	12.7mm	3.0mm	99.5%	0°	$45.5
125-008	1000-1060nm	25.4mm	6.0mm	99.5%	0°	$60.5
125-009	1000-1060nm	50.8mm	12.0mm	99.5%	0°	$136.5
125-010	1000-1060nm	12.7mm	3.0mm	99.5%	45°	$45.5
125-011	1000-1060nm	25.4mm	6.0mm	99.5%	45°	$60.5
125-012	1000-1060nm	50.8mm	12.0mm	99.5%	45°	$136.5

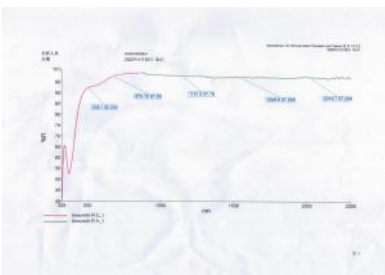
Ultrafast-Enhanced Silver Mirrors



- Stocked and custom mirrors available
- Made of Corning UV-grade Fused Silica
- High reflectance at 600-1000nm
- Slightly larger (yet still small) GDD and wider operating wavelength range than dielectric low GDD mirrors
- High flatness and surface quality

Utilizing a cutting-edge ultrafast-enhanced silver coating technique, Shalom EO's Ultra-fast Enhanced Silver Mirrors exhibit prevailing advantages for femtosecond pulse generations. The astoundingly high reflectance between the wavelength range of 600-1000nm, wide operating wavelengths and minimized Group Delay Dispersion (GDD) make our ultra-fast enhanced silver mirrors stand out from the crowd.

Shalom EO offers off-the-shelf and custom Ultra-fast Enhanced Silver Mirrors. The mirrors are excellent for the fundamental wavelength of Ti:Sapphire laser. The mirror substrates are made of Corning UV fused Silica Glass, high precision standards are utilized (λ/10 flatness, 20/10 S/D surface quality.)



Material	Corning UV-grade Fused Silica	Diameter	12.7-50.8mm
Surface Quality	20/10 S/D	Thickness	3-12mm
Flatness	λ/10	Coating	Enhanced silver

Product List of Ultrafast-Enhanced Silver Mirrors

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Coating	Unit Price
126-001	C7980-0F	12.7mm	3mm	20/10 S/D	λ/10	Enhanced silver	$30.5
126-002	C7980-0F	25.4mm	6mm	20/10 S/D	λ/10	Enhanced silver	$50.0
126-003	C7980-0F	50.8mm	12mm	20/10 S/D	λ/10	Enhanced silver	$121.5

BBO Crystals



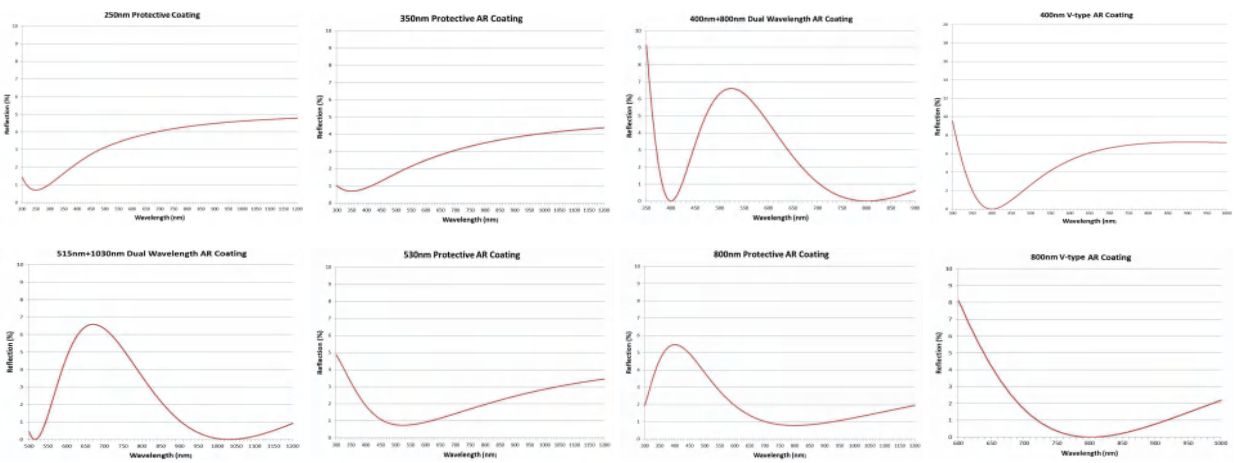
- Ultra-thin crystals: 0.01mm with FS substrate, 0.05mm free-standing optimized for femtosecond lasers
- Versatile applications: SHG,THG,4HG,5HG, OPO,OPA,OPG, SPDC, EO Modulations
- Maximum aperture: 20x20mm
- Coating options: P-coating/ multi-layer V-type AR coating/ dual wavelength AR coating

Beta-Barium borate (or β-BaB2O4, β-BBO) crystal is one of the most eminent nonlinear optical crystals. BBO crystal manifests outstanding high nonlinear optical coefficients (the crystal has an effective frequency doubling coefficient 3-6 times larger than the current general ADP and KDP crystals in the near-infrared, visible, and ultraviolet bands. The high nonlinear coefficient of BBO crystals translates into superior frequency conversion efficiencies, resulting in the generation of high-power pulses with femtosecond durations and megawatt peak powers. A broad transmission range of 189-3500 nm enables efficient conversion of frequencies across a broad wavelength range. The crystal also boasts an exception damage threshold (15Gw/cm2, twice higher than that of KDP), which allows it to withstand the intense optical fields associated with femtosecond pulses without suffering optical damage.

BBO crystals exhibit superior properties to KDP and ADP crystals in second harmonic generation (SHG) and third harmonic generation (THG) of ultrashort-pulse lasers.Hangzhou Shalom EO offers off-the-shelf and customized BBO crystals. The ultra-thin 0.01mm thickness with fused silica substrates and 0.05mm thickness free-standing BBO crystals optimized for femto-line lasers are available. All the crystals undergo rigorous inspection before despatch to ensure no visible scattering path or center is present within the crystals under the observation of a 50mW green laser.

Specifications:

Dimension Tolerance	(W±0.1mm)x(H±0.1mm)	Clear Aperture	central 90% or the diameter
Scattering of Crystals	No visible scattering path or center when inspected by a 50mW green Laser	Flatness	less than λ/8 @ 633nm
Transmitting Wavefront Distortion	less than λ/8 @ 633nm	Chamfer	≤0.2mmx45°
Chip	≤0.1mm	Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤20 arc seconds	Perpendicularity	≤5 arc minutes
Angle Tolerance	≤0.25°	Quality Warranty Period	one year under proper use



Product List of BBO Crystals

Code	Size	Thickness	θ	φ	Coating	Application	Unit Price
20201-001	6x6mm	0.01mm	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-002	6x6mm	0.02mm	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-003	6x6mm	0.05mm	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-004	6x6mm	0.1mm	23.4°	90°	P/P	SHG@1030nm Type1	$380
20201-005	6x6mm	0.5mm	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-006	6x6mm	1.0mm	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-007	6x6mm	1.5mm	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-008	6x6mm	2.0mm	23.4°	90°	P/P	SHG@1030nm Type1	$245
20201-009	6x6mm	0.01mm	29.2°	90°	P/P	SHG@800nm Type1	$380
20201-010	6x6mm	0.02mm	29.2°	90°	P/P	SHG@800nm Type1	$380
20201-011	6x6mm	0.05mm	29.2°	90°	P/P	SHG@800nm Type1	$380
20201-012	6x6mm	0.1mm	29.2°	90°	P/P	SHG@800nm Type1	$305
20201-013	6x6mm	0.2mm	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-014	6x6mm	0.5mm	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-015	6x6mm	1.0mm	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-016	6x6mm	2.0mm	29.2°	90°	P/P	SHG@800nm Type1	$245
20201-017	10x10mm	0.02mm	29.2°	90°	P/P	SHG@800nm Type1	$605
20201-018	10x10mm	0.05mm	29.2°	90°	P/P	SHG@800nm Type1	$605
20201-019	10x10mm	0.1mm	29.2°	90°	P/P	SHG@800nm Type1	$530
20201-020	10x10mm	0.2mm	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-021	10x10mm	0.5mm	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-022	10x10mm	1.0mm	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-023	10x10mm	1.5mm	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-024	10x10mm	2.0mm	29.2°	90°	P/P	SHG@800nm Type1	$455
20201-025	6x6mm	0.01mm	44.3°	90°	P/P	THG@800nm Type1	$380
20201-026	6x6mm	0.02mm	44.3°	90°	P/P	THG@800nm Type1	$380
20201-027	6x6mm	0.05mm	44.3°	90°	P/P	THG@800nm Type1	$380
20201-028	6x6mm	0.1mm	44.3°	90°	P/P	THG@800nm Type1	$305
20201-029	6x6mm	0.2mm	44.3°	90°	P/P	THG@800nm Type1	$245
20201-030	6x6mm	0.5mm	44.3°	90°	P/P	THG@800nm Type1	$245
20201-031	6x6mm	1.0mm	44.3°	90°	P/P	THG@800nm Type1	$245
20201-032	6x6mm	2.0mm	44.3°	90°	P/P	THG@800nm Type1	$245
20201-033	10x10mm	0.02mm	44.3°	90°	P/P	THG@800nm Type1	$605
20201-034	10x10mm	0.05mm	44.3°	90°	P/P	THG@800nm Type1	$605
20201-035	10x10mm	0.1mm	44.3°	90°	P/P	THG@800nm Type1	$530
20201-036	10x10mm	0.2mm	44.3°	90°	P/P	THG@800nm Type1	$455
20201-037	10x10mm	0.5mm	44.3°	90°	P/P	THG@800nm Type1	$455
20201-038	10x10mm	1.0mm	44.3°	90°	P/P	THG@800nm Type1	$455
20201-039	10x10mm	2.0mm	44.3°	90°	P/P	THG@800nm Type1	$575
20201-040	10x10mm	2.5mm	44.3°	90°	P/P	THG@800nm Type1	$575
20201-041	10x10mm	5.0mm	44.3°	90°	P/P	THG@800nm Type1	$760
20201-042	7x7mm	6.0mm	47.6°	90°	P/P	4HG@1064nm Type1	$560
20201-043	6x6mm	2.0mm	21.2°	90°	P/P	Type1 Phase Matching	$245
20201-044	5x5mm	0.5mm	23.4°	90°	P/P	Type1 Phase Matching	$245.0
20201-045	8x8mm	2.5mm	23.4°	90°	P/P	Type1 Phase Matching	$395
20201-046	10x10mm	0.1mm	28.5°	90°	P/P	Type1 Phase Matching	$530

Product List of BBO Crystals

Code	Size	Thickness	θ	φ	Coating	Application	Unit Price
20201-047	8x8mm	0.5mm	29°	90°	P/P	Type1 Phase Matching	$350
20201-048	8x8mm	2.5mm	29°	90°	P/P	Type1 Phase Matching	$395
20201-049	6x6mm	1.0mm	29.2°	90°	P/P	Type1 Phase Matching	$245
20201-050	8x8mm	1.0mm	29.2°	90°	P/P	Type1 Phase Matching	$350
20201-051	6x6mm	2.0mm	30°	90°	P/P	Type1 Phase Matching	$245
20201-052	6x6mm	0.2mm	30.5°	90°	P/P	Type1 Phase Matching	$245
20201-053	6x6mm	1.0mm	30.5°	90°	P/P	Type1 Phase Matching	$245
20201-054	6x6mm	2.0mm	30.5°	90°	P/P	Type1 Phase Matching	$245
20201-055	3x3mm	4.0mm	31.3°	90°	P/P	Type1 Phase Matching	$245
20201-056	3x3mm	6.0mm	31.3°	90°	P/P	Type1 Phase Matching	$245
20201-057	6x6mm	2.0mm	31.5°	90°	P/P	Type1 Phase Matching	$245
20201-058	6x6mm	2.5mm	31.5°	90°	P/P	Type1 Phase Matching	$245
20201-059	8x8mm	0.6mm	32°	90°	P/P	Type1 Phase Matching	$350
20201-060	8x8mm	1.0mm	32°	90°	P/P	Type1 Phase Matching	$350
20201-061	6x6mm	0.6mm	32.5°	90°	P/P	Type1 Phase Matching	$245
20201-062	6x6mm	1.0mm	32.5°	90°	P/P	Type1 Phase Matching	$245
20201-063	8x8mm	0.8mm	32.5°	90°	P/P	Type1 Phase Matching	$350
20201-064	5x5mm	2.5mm	32.6°	90°	P/P	Type1 Phase Matching	$245
20201-065	5x5mm	4.0mm	32.6°	90°	P/P	Type1 Phase Matching	$275
20201-066	8x8mm	1.0mm	35°	90°	P/P	Type1 Phase Matching	$350
20201-067	8x8mm	2.0mm	35°	90°	P/P	Type1 Phase Matching	$350
20201-068	20x20mm	0.15mm	35°	90°	P/P	Type1 Phase Matching	$1970
20201-069	20x20mm	0.2mm	35°	90°	P/P	Type1 Phase Matching	$1970
20201-070	10x10mm	3.0mm	40.3°	90°	P/P	Type1 Phase Matching	$575
20201-071	8x8mm	0.3mm	42.8°	90°	P/P	Type1 Phase Matching	$350
20201-072	6x6mm	0.2mm	43°	90°	P/P	Type1 Phase Matching	$245
20201-073	8x8mm	0.1mm	43°	90°	P/P	Type1 Phase Matching	$395.0
20201-074	8x8mm	0.5mm	43°	90°	P/P	Type1 Phase Matching	$350
20201-075	5x5mm	1.0mm	44°	90°	P/P	Type1 Phase Matching	$245
20201-076	8x8mm	0.15mm	44.3°	90°	P/P	Type1 Phase Matching	$350
20201-077	8x8mm	0.5mm	44.3°	90°	P/P	Type1 Phase Matching	$350
20201-078	10x10mm	0.4mm	45.9°	90°	P/P	Type1 Phase Matching	$455
20201-079	3x3mm	4.0mm	47.7°	90°	P/P	Type1 Phase Matching	$245
20201-080	8x8mm	1.0mm	47.7°	90°	P/P	Type1 Phase Matching	$350
20201-081	8x8mm	3.0mm	47.7°	90°	P/P	Type1 Phase Matching	$440
20201-082	10x10mm	1.0mm	47.7°	90°	P/P	Type1 Phase Matching	$455
20201-083	10x10mm	2.5mm	47.7°	90°	P/P	Type1 Phase Matching	$575
20201-084	8x8mm	0.1mm	48°	90°	P/P	Type1 Phase Matching	$395
20201-085	8x8mm	0.2mm	48°	90°	P/P	Type1 Phase Matching	$350
20201-086	4x4mm	2.8mm	51.2°	90°	P/P	Type1 Phase Matching	$245
20201-087	5x5mm	2.5mm	28°	30°	P/P	Type2 Phase Matching	$245
20201-088	8x8mm	2.5mm	28°	30°	P/P	Type2 Phase Matching	$395
20201-089	5x5mm	2.0mm	28.7°	30°	P/P	Type2 Phase Matching	$245
20201-090	8x8mm	0.6mm	30°	30°	P/P	Type2 Phase Matching	$350
20201-091	10x10mm	1.0mm	32°	30°	P/P	Type2 Phase Matching	$575
20201-092	10x10mm	5.0mm	32°	30°	P/P	Type2 Phase Matching	$760

LBO Crystals



- Stocked and custom LBO crystals are available
- Orientations: cutting for Type I phase-matching or custom
- Large effective SHG coefficient (3X that of KDP) and high damage threshold
- Wide acceptance angle and small angular walk-off
- Maximum dimension: 70x70x20mm
- Coating options: standard AR/AR@515+1030nm or custom

Lithium Tri-borate or LBO crystals (LiB_3O_5) are one of the most capable nonlinear optical materials. The merits of LBO crystals are manifold, including large conversion efficiencies, a wide transparent spectral region from 160nm to 2600nm, a high damage threshold, broad acceptance angle, and miniature angular walk off, etc.

Hangzhou Shalom EO offers off-the-shelf and custom LBO crystals optimized for femtosecond lasers. Our LBO crystals empower users with stunning excellence for the generation of ultrashort pulses with high conversion efficiencies, which translate into high output power. Large aperture sizes with a maximum dimension of 70x70x20mm, and standard or custom coating options are available.

Common Specifications:

Materials	LBO crystals	Type	Type 1
Cutting	θ=90°±0.5°, Φ=13.8°±0.5°	Flatness	less than λ/8 @ 633nm
Wavefront Distortion	less than λ/8 @ 633nm	Surface Quality	10/5 S/D
Parallelism	20 arc second	Coating	AR/AR@515+1030nm

Product List of LBO Crystals

Code	Size	Thickness	θ	φ	Coating	Application	Unit Price
2113-001	6x6mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$270
2113-002	8x8mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$310
2113-003	10x10mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$350
2113-004	12x12mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$450
2113-005	15x15mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-006	20x20mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-007	22x22mm	1.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-008	6x6mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$250
2113-009	8x8mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$310
2113-010	10x10mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$400
2113-011	12x12mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$470
2113-012	15x15mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-013	20x20mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-014	22x22mm	2.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-015	6x6mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$280
2113-016	8x8mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$400
2113-017	10x10mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$520
2113-018	12x12mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$550
2113-019	15x15mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-020	20x20mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-021	22x22mm	3.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-022	6x6mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$250
2113-023	8x8mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$420
2113-024	10x10mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$540
2113-025	12x12mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	$580
2113-026	15x15mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-027	20x20mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire
2113-028	22x22mm	4.0mm	θ=90°	13.8°	AR/AR@515+1030nm	SHG1030nm Type1	Inquire

High Precision Thin N-BK7, UV Fused Silica Windows



- Off-the-shelf and custom modules available
- Made of BK7, UVFS, or Quartz Crystals
- Minute thickness and high surface flatness
- Surface quality 10/5 and parallelism 10"
- Minimum thickness: 0.03mm, minimum size: 0.5mm
- Uncoated mirror substrates and custom AR coating options available

Hangzhou Shalom EO has developed a double surface polishing method for the production of High Precision Thin Optical Windows or Substrates, where the surfaces of the windows or substrates are polished in one go, achieving accurate control of surface flatness while elevating the surface quality to 10/5 S/D. The high-precision thin windows manufactured in our factory are of outstanding functionalities that could meet the criteria for ultra-thin (0.1mm, 0.2mm) windows or substrates with high surface flatness (Lambda/10 or Lambda/4 @633nm), oriented for applications for precision optical systems such as Femtosecond lasers, whose market share is surging in recent years.

The double surface polishing method is a processing technique, where both of the two surfaces of optics complete their polishing procedure in one go. The optics are not put on pitch plates during the procedure, so that is no stress-releasing problem caused by bonding and detachment between the optics being polished and the carrier plate, which eliminates the variation of surface flatness of the window substrate to significant extent. High Precision Thin windows made from BK7, UV Fused Silica, and Quartz Crystals are available in Shalom EO, the windows feature superior surface quality of 10/5 Scratch/Dig, parallelism of 10 arcsec, with minimum thickness down to 0.03mm, diameter down to 0.5mm. N-BK7 is beneficial wavelengths from the Visible to IR spectrum (350-2000nm), and UV Fused Silica is recommendable for UV wavelengths due to low absorption in the UV range. Both of them are renowned optical glass materials with substantial mechanical strength and thermal stability and can endure operations under various conditions. Besides, windows made from Quartz Crystal are also provided.

The standard specifications of Thin BK7, UVFS, and Quartz Crystals Windows offered in Shalom EO include 12.7mmx0.2mm with λ/2 flatness, 12.7mmx1.0mm with λ/10 flatness, 25.4mmx0.2mm with λ/2 flatness and 25.4mmx1.0mm with λ/10 flatness, in addition to other custom dimensions. The windows could be configured with mounts for ease of handling, both uncoated window substrates and custom AR coatings are available.

specification:

Material	N-BK7，C7980-0F，Quartz	Diameter	12.7mm，25.4mm
Thickness	0.2mm，1.0mm	Surface Quality	10/5 S/D
Flatness	λ/2，λ/10	Parallelism	10 arcsec
Coating	Uncoated	Customization	available

Product List of High Precision Thin N-BK7, UV Fused Silica Windows

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
135-001	N-BK7	12.7mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$30.0
135-002	N-BK7	12.7mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
135-003	N-BK7	25.4mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$45.0
135-004	N-BK7	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$45.0
135-005	C7980-0F	12.7mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$38.0
135-006	C7980-0F	12.7mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$38.0
135-007	C7980-0F	25.4mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$60.0
135-008	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$60.0
135-009A	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0

Group Velocity Delay Compensators



- Stocked and custom compensators are available
- Substrate materials option: Calcite, Alpha-BBO crystal
- Excellent for ultrafast femtosecond pulsed lasers
- Recommended angular tuning range: AOI +/-12°
- Standard operating wavelength: 800nm/400nm, 1030nm/515nm, and 600nm/300nm

Shalom EO offers off-the-shelf and custom Group Velocity Delay (GVD) Compensation Plates for femtosecond lasers. The group velocity delay compensators are optimized for offsetting the specified amount of time delay between the fundamental wavelength and the harmonic wavelength of orthogonal polarizations via introducing controlled amounts of dispersion opposite in sign to that of the dispersive elements.

The precise delay time can be controlled by rotating the compensator. The recommended range of the AOI for Shalom EO's Group Velocity Delay Compensators is +/-12°. We offer group velocity compensators made of two materials: Calcite group velocity delay compensators and Alpha-BBO group velocity delay compensators. Standard operating wavelengths include 800nm/400nm, 1030nm/515nm, and 600nm/300nm, while other custom-specified wavelengths and delay amounts can be tailored upon request.

Common Specifications:

Materials	Calcite or alpha-BBO	Orientation Tolerance	+/-0.5°
Flatness	λ/4@633nm	Transmission Wavefront Distortion	λ/4@633nm
Surface Quality	20/10 S/D	Parallelism	<30 arc sec

Basic Properties of Calcite:

Density	2.7 g/cm3	Melting Point	730℃
Mohs Hardness	3	Transparency Range	350-2300nm
Thermal Expansion Coefficients（/℃）	aa=24.39×10-6/K ac=5.68×10-6/K	Refractive Index	no=2.260 nε=2.142
Damage Threshold	>1GW/cm2	Sellmeier Equation (λ in μm)	no2=2.69705 + 0.0192064/(λ2-0.01820) - 0.0151624λ2 ne2=2.18438 + 0.0087309/(λ2-0.01018) - 0.0024411λ2

Basic Properties of Alpha-BBO Crystal:

Transparency Range	190-3500nm	Density	3.85g/cm3
Hygroscopic Susceptibility	low	Mohs Hardness	4.5
Damage Threshold	>1GW/cm2	Sellmeier Equation(λ in μm)	no2 = 2.7471+0.01878/(λ2 -0.01822)-0.01354λ2 ne2 = 2.37153+0.01224/(λ2 -0.01667)-0.01516λ2

Product List of Group Velocity Delay Compensators

Code	Material	Wavelength	Aperture	Unit Price
2116-001	Calcite	800/400nm	12mm	$315
2116-002	Calcite	800/400nm	12mm	$315
2116-003	Calcite	800/400nm	12mm	$315
2116-004	Calcite	800/400nm	12mm	$315
2116-005	Calcite	1030/515nm	12mm	$315
2116-006	Calcite	1030/515nm	12mm	$315
2116-007	Calcite	1030/515nm	12mm	$315
2116-008	Calcite	1030/515nm	12mm	$315
2116-009	α-BBO	600/300nm	12mm	$375
2116-010	α-BBO	1030/515nm	12mm	$315

CO2 Laser Optics

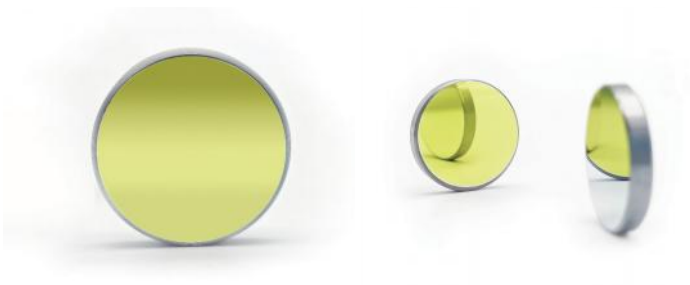


Hangzhou Shalom EO offers a comprehensive series of optical components specified for CO2 lasers. Our product catalog includes:

ZnSe (Zinc Selenide) Focusing Lenses optimized for precise focusing within CO2 laser modules. GaAs (Gallium Arsenide) Focusing Lenses designed to enhance CO2 laser performance. Scanning Mirrors engineered for accurate beam scanning in CO2 laser applications. Molybdenum (Mo) Mirrors oriented to accommodate CO2 laser setups. Silicon (Si) Mirrors, which are precision-engineered for optimal performance in CO2 laser applications.

Discover optical superiority and specialized optical solutions to elevate your CO2 laser modules with Hangzhou Shalom EO.

Silicon (Si) Mirrors for CO2 Lasers



Silicon mirror is one of the most prevalent reflective mirror for lasers. The inherent transmission range 1 - 25 μm spectral range, low cost, decent thermal endurance and durability render silicon mirrors an excellent option for CO2 lasers. Si mirrors are recommended for lower power CO2 lasers in clean conditions. Shalom EO offers standard and custom silicon mirrors. Regarding the standard silicon mirrors, various dimensions with diameters from 12mm to 200mm and thicknesses from 3mm to 15mm are available. Advanced polishing and coating techniques are utilized to ensure reflectance above 99% for unpolarized radiation, and a laser damage threshold of 4 kW for Ø 10 mm, minimizing scattering and wavefront distortion, optimizing mirror performance over prolonged use in harsh laser environment.

Specifications:

Materials	Silicon (Si)	Density	2.33 g/cm3
Surface Quality	40/20 S/D (MIL-PRF-13830B)	Clear Aperture	>80% of full dimension
Dimensional Tolerance	+0.0 -0.2 mm	Thickness Tolerance	±0.25 mm
Surface Flatness	λ/4 @ 633nm	Operation Wavelength	10.6 μm
Coating	protected gold	Reflectivity for Unpolarized Radiation	>99%
Laser Damage Threshold	4 kW for Ø 10 mm		

Modules or Types:

Following modules and types of the Silicon mirrors are available in stock:

Diameter (mm)	Thickness(mm)	Substrate Materials	Reflections at 10.6μm
12	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
18	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
19	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
20	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
25	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
25.4	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
30	3	Monocrystalline Silicon	R≥99% at λ=10.6μm
38.1	5	Monocrystalline Silicon	R≥99% at λ=10.6μm
50.8	7	Monocrystalline Silicon	R≥99% at λ=10.6μm
200	15	Monocrystalline Silicon	R≥99% at λ=10.6μm

ZnSe Focusing Lenses for CO2 Lasers



- Two shapes of lenses are available: Plano-convex and Meniscus lenses
- High-quality CVD ZnSe grown in the USA, ensuring efficient power output and thermal resistance
- AR coating with an excellent transmittance of T≥99.5%@10.6mm
- Maximum diameter 200mm
- Off-the-shelf and custom versions offered

Focusing Lens is an indispensable part of CO2 lasers designed for laser processing (cutting, punching, welding, graving, etc) and other kinds of purposes, serving to focus, collect, or collimate laser light. Shalom EO offers two shapes of laser focusing lenses, plano-convex and meniscus lenses. In general, Plano-convex ZnSe Lenses are the more conventional option, but for applications involving greater beam sizes and power densities, Meniscus ZnSe Lenses excel in terms of lower spherical aberrations. Zinc Selenide (ZnSe) is a popular material for the manufacturing of focusing lenses for CO2 lasers. ZnSe is favorable for CO2 laser and other IR applications with a wide transmission range of 600-16000nm and due to the fact that it has the lowest absorption compared to other common 1060nm CO2 laser wavelength transmitting materials, it exhibits prevailing advantages in circumstances in applications of high-power intensities. However, being soft, ZnSe might be more sensitive to scratches. For applications in dirty or high-splatter environments, Shalom recommends Our GaAs focusing lenses for CO2 lasers, which have a higher hardness and greater thermal endurance.

Hangzhou Shalom EO offers Plano-convex and Meniscus Zinc Selenide (ZnSe) Focusing Lens for CO2 lasers and versatile applications. For off-the-shelf versions, the specifications are: Diameters 12.0-38.1mm, Central Thicknesses 2.6-7.87mm, Focal Length 38.1-190.5mm with 10.6μm AR Coatings. For custom versions, the maximum diameter is 200mm, suggesting that greater potential to handle higher power levels is available.

Shalom EO chooses CVD (Chemically Vapor Deposited) ZnSe grown in the USA which features exceedingly low bulk losses induced by absorption and scatter, high resistance to thermal shock, and stable properties that could cater to various operations environments. Due to the high refractive index of ZnSe, AR coating is critical to obtaining high transmission. In addition, Shalom EO incorporates the minimum-damage polishing technique during the coating process, and our AR coating ensures a high damage threshold, high durability, and wiping resistance, with an excellent transmittance of T≥99.5%@10.6mm. We also offer design services for the mirrors, Shalom EO's proficient and capable engineering team is prepared and willing all the time to deliver you the optimized mirror design and the best price effectiveness.

Specifications:

Materials	CVD ZnSe crystals	Size Tolerance	+0.0/-0.1mm
Central Thickness Tolerance	+/-0.1mm	Surface Quality	40/20 S/D
Fringes (N)	<3	Irregularity(delta N)	<1
Centration	<3′	Tolerance of Focal Length	+/-1%
Aperture	>90%	Chamfer	0.1-0.3mmx45degree
Coating	AR/AR@10.6μm (T>99.5%@10.6μm)		

Basic Properties:

Transmission Range	0.6 to 21.0μm	Refractive Index	2.4028 at 10.6μm
Reflection Loss	29.1% at 10.6μm (2 surfaces)	Absorption Coefficient	0.0005 cm-1 at 10.6μm
Reststrahlen Peak	45.7μm	dn/dT	+61 x 10-6 /°C at 10.6μm at 298K
dn/dμ = 0	5.5μm	Density	5.27 g/cc
Melting Point	1525°C (see notes below)	Thermal Conductivity	18 W m-1 K-1 at 298K
Thermal Expansion	7.1 x 10-6 /°C at 273K	Hardness	Knoop 120 with 50g indenter
Specific Heat Capacity	339 J Kg-1 K-1	Dielectric Constant	n/a
Youngs Modulus (E)	67.2 GPa	Shear Modulus (G)	n/a
Bulk Modulus (K)	40 GPa	Elastic Coefficients	Not Available
Apparent Elastic Limit	55.1 MPa (8000 psi)	Apparent Elastic Limit	55.1 MPa (8000 psi)
Poisson Ratio	0.28	Solubility	0.001g/100g water
Molecular Weight	144.33	Class/Structure	HIP polycrystalline cubic, ZnS, F43m

Product List of ZnSe Focusing Lenses for CO2 Lasers

Code	Types	Material	Diameter	CT	Focal length	Coating	Unit Price
2121-001	Plano Convex	ZnSe	12.0mm	2.8mm	38.1mm	AR@10.6μm	$14.00
2121-002	Meniscus	ZnSe	12.0mm	2.6mm	50.8mm	AR@10.6μm	$14.00
2121-003	Meniscus	ZnSe	12.0mm	2.6mm	63.5mm	AR@10.6μm	$14.00
2121-004	Plano Convex	ZnSe	12.0mm	2.8mm	76.2mm	AR@10.6μm	$14.00
2121-005	Plano Convex	ZnSe	12.0mm	2.8mm	95.25mm	AR@10.6μm	$14.00
2121-006	Plano Convex	ZnSe	12.0mm	2.8mm	101.6mm	AR@10.6μm	$14.00
2121-007	Meniscus	ZnSe	12.0mm	2.6mm	127mm	AR@10.6μm	$14.00
2121-008	Meniscus	ZnSe	12.0mm	2.6mm	190.5mm	AR@10.6μm	$14.00
2121-009	Plano Convex	ZnSe	15.0mm	2.8mm	38.1mm	AR@10.6μm	$19.50
2121-010	Meniscus	ZnSe	15.0mm	2.6mm	50.8mm	AR@10.6μm	$19.50
2121-011	Meniscus	ZnSe	15.0mm	2.6mm	63.5mm	AR@10.6μm	$19.50
2121-012	Plano Convex	ZnSe	15.0mm	2.8mm	76.2mm	AR@10.6μm	$19.50
2121-013	Plano Convex	ZnSe	15.0mm	2.8mm	95.25mm	AR@10.6μm	$19.50
2121-014	Plano Convex	ZnSe	15.0mm	2.8mm	101.6mm	AR@10.6μm	$19.50
2121-015	Meniscus	ZnSe	15.0mm	2.6mm	127mm	AR@10.6μm	$19.50
2121-016	Meniscus	ZnSe	15.0mm	2.6mm	190.5mm	AR@10.6μm	$19.50
2121-017	Plano Convex	ZnSe	18.0mm	2.8mm	38.1mm	AR@10.6μm	$22.00
2121-018	Meniscus	ZnSe	18.0mm	2.6mm	50.8mm	AR@10.6μm	$22.00
2121-019	Meniscus	ZnSe	18.0mm	2.6mm	63.5mm	AR@10.6μm	$22.00
2121-020	Plano Convex	ZnSe	18.0mm	2.8mm	76.2mm	AR@10.6μm	$22.00
2121-021	Plano Convex	ZnSe	18.0mm	2.8mm	95.25mm	AR@10.6μm	$22.00
2121-022	Plano Convex	ZnSe	18.0mm	2.8mm	101.6mm	AR@10.6μm	$22.00
2121-023	Meniscus	ZnSe	18.0mm	2.6mm	127mm	AR@10.6μm	$22.00
2121-024	Meniscus	ZnSe	18.0mm	2.6mm	190.5mm	AR@10.6μm	$22.00
2121-025	Plano Convex	ZnSe	19.0mm	2.8mm	38.1mm	AR@10.6μm	$22.00
2121-026	Meniscus	ZnSe	19.0mm	2.6mm	50.8mm	AR@10.6μm	$22.00
2121-027	Meniscus	ZnSe	19.0mm	2.6mm	63.5mm	AR@10.6μm	$22.00
2121-028	Plano Convex	ZnSe	19.0mm	2.8mm	76.2mm	AR@10.6μm	$22.00
2121-029	Plano Convex	ZnSe	19.0mm	2.8mm	95.25mm	AR@10.6μm	$22.00
2121-030	Plano Convex	ZnSe	19.0mm	2.8mm	101.6mm	AR@10.6μm	$22.00
2121-031	Meniscus	ZnSe	19.0mm	2.6mm	127mm	AR@10.6μm	$22.00
2121-032	Meniscus	ZnSe	19.0mm	2.6mm	190.5mm	AR@10.6μm	$22.00
2121-033	Plano Convex	ZnSe	20.0mm	2.8mm	38.1mm	AR@10.6μm	$22.00
2121-034	Meniscus	ZnSe	20.0mm	2.6mm	50.8mm	AR@10.6μm	$22.00
2121-035	Meniscus	ZnSe	20.0mm	2.6mm	63.5mm	AR@10.6μm	$22.00
2121-036	Plano Convex	ZnSe	20.0mm	2.8mm	76.2mm	AR@10.6μm	$22.00

Product List of ZnSe Focusing Lenses for CO2 Lasers

Code	Types	Material	Diameter	CT	Focal length	Coating	Unit Price
2121-037	Plano Convex	ZnSe	20.0mm	2.8mm	95.25mm	AR@10.6μm	$22.00
2121-038	Plano Convex	ZnSe	20.0mm	2.8mm	101.6mm	AR@10.6μm	$22.00
2121-039	Meniscus	ZnSe	20.0mm	2.6mm	127mm	AR@10.6μm	$22.00
2121-040	Meniscus	ZnSe	20.0mm	2.6mm	190.5mm	AR@10.6μm	$22.00
2121-041	Plano Convex	ZnSe	22.0mm	2.8mm	38.1mm	AR@10.6μm	$26.00
2121-042	Meniscus	ZnSe	22.0mm	2.6mm	50.8mm	AR@10.6μm	$26.00
2121-043	Meniscus	ZnSe	22.0mm	2.6mm	63.5mm	AR@10.6μm	$26.00
2121-044	Plano Convex	ZnSe	22.0mm	2.8mm	76.2mm	AR@10.6μm	$26.00
2121-045	Plano Convex	ZnSe	22.0mm	2.8mm	95.25m	AR@10.6μm	$26.00
2121-046	Plano Convex	ZnSe	22.0mm	2.8mm	101.6mm	AR@10.6μm	$26.00
2121-047	Meniscus	ZnSe	22.0mm	2.6mm	127mm	AR@10.6μm	$26.00
2121-048	Meniscus	ZnSe	22.0mm	2.6mm	190.5mm	AR@10.6μm	$26.00
2121-049	Plano Convex	ZnSe	25.0mm	3.7mm	38.1mm	AR@10.6μm	$45.00
2121-050	Meniscus	ZnSe	25.0mm	3.2mm	50.8mm	AR@10.6μm	$45.00
2121-051	Meniscus	ZnSe	25.0mm	3.2mm	63.5mm	AR@10.6μm	$45.00
2121-052	Plano Convex	ZnSe	25.0mm	3.7mm	76.2mm	AR@10.6μm	$45.00
2121-053	Plano Convex	ZnSe	25.0mm	3.7mm	95.25mm	AR@10.6μm	$45.00
2121-054	Plano Convex	ZnSe	25.0mm	3.7mm	101.6mm	AR@10.6μm	$45.00
2121-055	Meniscus	ZnSe	25.0mm	3.2mm	127mm	AR@10.6μm	$45.00
2121-056	Meniscus	ZnSe	25.0mm	3.2mm	190.5mm	AR@10.6μm	$45.00
2121-057	Plano Convex	ZnSe	28.0mm	3.77mm	38.1mm	AR@10.6μm	$80.00
2121-058	Meniscus	ZnSe	28.0mm	3.0mm	50.8mm	AR@10.6μm	$80.00
2121-059	Meniscus	ZnSe	28.0mm	3.0mm	63.5mm	AR@10.6μm	$80.00
2121-060	Plano Convex	ZnSe	28.0mm	3.77mm	76.2mm	AR@10.6μm	$80.00
2121-061	Plano Convex	ZnSe	28.0mm	3.77mm	95.25mm	AR@10.6μm	$80.00
2121-062	Plano Convex	ZnSe	28.0mm	3.77mm	101.6mm	AR@10.6μm	$80.00
2121-063	Meniscus	ZnSe	28.0mm	3.0mm	127mm	AR@10.6μm	$80.00
2121-064	Meniscus	ZnSe	28.0mm	3.0mm	190.5mm	AR@10.6μm	$80.00
2121-065	Plano Convex	ZnSe	38.1mm	7.87mm	38.1mm	AR@10.6μm	$80.00
2121-066	Meniscus	ZnSe	38.1mm	7.87mm	50.8mm	AR@10.6μm	$80.00
2121-067	Meniscus	ZnSe	38.1mm	7.87mm	63.5mm	AR@10.6μm	$80.00
2121-068	Plano Convex	ZnSe	38.1mm	7.87mm	76.2mm	AR@10.6μm	$80.00
2121-069	Plano Convex	ZnSe	38.1mm	7.87mm	95.25mm	AR@10.6μm	$80.00
2121-070	Plano Convex	ZnSe	38.1mm	7.87mm	101.6mm	AR@10.6μm	$80.00
2121-071	Meniscus	ZnSe	38.1mm	7.87mm	127mm	AR@10.6μm	$190.00
2121-072	Meniscus	ZnSe	38.1mm	7.87mm	190.5mm	AR@10.6μm	$190.00

GaAs Focusing Lenses for CO2 Lasers



Semi-insulating Gallium Arsenide (GaAs) Lenses stand out with their appealing attributes of superior robustness. GaAs lens provides an alternative to the ZnSe lens in medium and high-power continuous wave CO2 lasers. GaAs are useful in particular when toughness and durability are important. Its hardness and strength render GaAs lenses a good choice where dust or abrasive particles tend to build up or bombard the optical surface. While substrates made of other softer materials allow particles to be embedded in the mirrors even when the best coatings are used.

Shalom EO offers standard and custom GaAs Lenses optimized for CO2 lasers and various applications, including two lens shapes: Plano-convex GaAs lenses and meniscus GaAS. The plano-convex lenses are the more conventional option if you have less stricter requirement for the spherical aberration, the meniscus lenses are engineered to reduce the diffraction and aberration, ensuring the laser beam has a minimum beam-spot diameter. Hangzhou Shalom EO also offers design services for meniscus-shaped GaAs lenses, specified products can be tailored for optimum optical functionalities.

Specifications:

Materials	GaAs	Size Tolerance	+0.0/-0.1mm
Central Thickness Tolerance	+/-0.1mm	Surface Quality	40/20 S/D
Fringes (N)	<3	Irregularity(delta N)	<1
Centration	<3'	Tolerance of Focal	+/-1%
Length	+/-1%	Chamfer	0.1-0.3mmx45degree
Coating	AR/AR@10.6μm (T>99.5%@10.6μm)		

Physical Properties:

Bulk Absorption Coefficient @ 10.6μm	<= 0.01 /cm	Temperature Change of Refractive Index @ 10.6μm	149 x 10-6/°C
Thermal Conductivity @ 20° C	0.48 W/cm/°C	Specific Heat	0.325 J/g/°C
Linear Expansion Coefficient @ 20° C	5.7 x 10-6/°C	Young's Modulus	83 GPa (12.04 x 106 psi)
Rupture Modulus	138 MPa (20,000 psi)	Knoop Hardness	750 kg/mm2
Density	5.37 g/cm3	Poisson's Ratio	0.31

Modules or Types:

Diameter (mm)	Edge-thickness (mm)	Materials	Lens Types(Optional)	Focal Length (mm) (optional)	Wavelength(μm)
12	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
18	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
19	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
20	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
25	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
25.4	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
30	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6
38.1	2	GaAs	Plano-Convex or Meniscus	25.4/38.1/41/50.8/63.5/100	10.6

Scanning Mirrors for CO2 Lasers



- Precision-calculated dimensions ensure an optimal match with laser beam size, facilitating efficient scanning performance
- Consisting of a silicon substrate and gold coating oriented for CO2 lasers (10.6μm)
- Designed for simple mounting onto the galvanometers, ensuring seamless integration into high-speed two-axis laser scanning systems
- Available in stock and custom versions, mirrors mounted on galvanometers are also available

Shalom EO offers standard and custom Scanning Mirrors for CO2 lasers, the mirrors each consist of a silicon substrate and a gold coating, boasting high heat dissipation and exceptional reflectance. The dynamic response characteristics are engineered with meticulous care to meet the stringent requirements of industrial laser processing applications. Simple mounting onto galvanometers is also ensured contributing to the unique design. With a large selection of various specifications, Shalom EO's scanning mirrors present a comprehensive range of solutions to facilitate the scanning and positioning of the laser beam with unparalleled accuracy and speed.

Specifications:

Surface Figure	λ/4 @633nm per 1"Diameter	Surface Quality	40/20 S/D
Reflective Coating	Silicon, Gold coating for CO2 Laser (10.6μm)	Mounted scanning mirror are available upon request.	

Modules or Types:

Module No.	Beam Size (mm)	Dimension (LxWxT,mm)	Substrate and Coating
SM10.6-8X-18x13x1.2-SJ	8	18x13x1.2	Gold coated Silicon
SM10.6-8Y-22x15x1.2-SJ	8	22x15x1.2	Gold coated Silicon
SM10.6-10X-20x15x1.2-SJ	10	20x15x1.2	Gold coated Silicon
SM10.6-10Y-27.5x17x1.2-SJ	10	27.5x17x1.2	Gold coated Silicon
SM10.6-10X-20.3x13.7x1.5-WT	10	20.3x13.7x1.5	Gold coated Silicon
SM10.6-10Y-24.4x17.8x1.5-WT	10	24.4x17.8x1.5	Gold coated Silicon
SM10.6-10X-18x14x2-LK	10	18x14x2	Gold coated Silicon
SM10.6-10Y-24x16x2-LK	10	24x16x2	Gold coated Silicon
SM10.6-12X-21x16.8x2-SJ	12	21x16.8x2	Gold coated Silicon
SM10.6-12Y-30x19x2-SJ	12	30x19x2	Gold coated Silicon
SM10.6-12X-21x16x2-WT	12	21x16x2	Gold coated Silicon
SM10.6-12Y-32x19x2-WT	12	32x19x2	Gold coated Silicon
SM10.6-12X-20x16x2-LK	12	20x16x2	Gold coated Silicon
SM10.6-12Y-30x19x2-LK	12	30x19x2	Gold coated Silicon
SM10.6-15X-27x19x2-SJ	15	27x19x2	Gold coated Silicon
SM10.6-15Y-37x22x2-SJ	15	37x22x2	Gold coated Silicon
SM10.6-16X-28x20x2-SJ	16	28x20x2	Gold coated Silicon
SM10.6-16Y-39x23x2-SJ	16	39x23x2	Gold coated Silicon
SM10.6-16X-27x21-2.5-LK	16	27x21-2.5	Gold coated Silicon
SM10.6-16Y-38x24x2.5-LK	16	38x24x2.5	Gold coated Silicon
SM10.6-20X-37x24x2-SJ	20	37x24x2	Gold coated Silicon
SM10.6-20Y-49x31x2-SJ	20	49x31x2	Gold coated Silicon
SM10.6-25X-46x30x3-SJ	25	46x30x3	Gold coated Silicon
SM10.6-25Y-56.4x39x3-SJ	25	56.4x39x3	Gold coated Silicon

Molybdenum (Mo) Mirrors for CO2 Lasers



- High optical damage threshold
- High anti-corrosion stability
- Hard and extremely scratch-resistant, robust surface with unrestricted cleanability
- Low absorption and scattering losses: < 2%
- High thermal conductivity: 138 W/mK
- High IR reflectivity: > 98%@10.6μm

Molybdenum ("Moly") Mirrors are the toughest, most durable, longest-lasting laser mirrors currently available. Molybdenum has the lowest thermal expansion among all commercial metal materials and therefore mirrors made of Molybdenum can withstand extreme temperatures with low susceptibility to deformation or softening. For infrared applications, the Molybdenum mirror has a high natural reflectance (around 98%) over a broad spectrum.

Shalom EO offers standard and custom Molybdenum Mirrors. Molybdenum mirrors need no coating due to their inherently high reflection in the IR spectrum, Shalom EO's state-of-the-art mirror fabrication technique endowed the uncoated polished substrates with excellent robustness and quality, which translate to boast prominent thermal, and mechanical properties, and high chemical inertia, ensuring stable operations in high-power and high-temperature situations and in conditions where weld spatter, fumes, smoke, and process debris prevail. In terms of optical performance, Our Mo mirrors also stand out with their high IR reflectance (>98%@10.6μm), low absorption, and low scattering loss. The mirrors are extraordinarily scratch-resistant and can be scrubbed with brushes scrubbed with brushes, soaked in organic solvents or detergents in repetition.

Specifications:

Reflectivity	R≥98% at 10.6μm	Diameter Tolerance	+0.0/-0.1mm
Thickness Tolerance	+/-0.1mm	Surface Quality	60/40 S/D
Wedge	<3 arc minutes	Flatness	λ/20@10.6μm, over f50mm
Clear Aperture	90% of diameter	Laser Damage Threshold	60KW for f10mm (6000W/mm)

Modules or Types:

Following modules and types of the Molybdenum mirrors are available in stock:

Diameter (mm)	Thickness(mm)	Substrate Materials	Reflections at 10.6μm
12	3	Molybdenum	R≥98% at λ=10.6μm
18	3	Molybdenum	R≥98% at λ=10.6μm
19	3	Molybdenum	R≥98% at λ=10.6μm
20	3	Molybdenum	R≥98% at λ=10.6μm
25	3	Molybdenum	R≥98% at λ=10.6μm
25.4	3	Molybdenum	R≥98% at λ=10.6μm
30	3	Molybdenum	R≥98% at λ=10.6μm
38.1	3	Molybdenum	R≥98% at λ=10.6μm
50.8	3	Molybdenum	R≥98% at λ=10.6μm
75	3	Molybdenum	R≥98% at λ=10.6μm

Fiber Laser Optical Components



Fiber Lasers, in most cases, are defined as laser systems that incorporate optical fiber amplifiers as the laser gain media for the generation and amplification of the input light signal. The core of optical fiber amplifiers is usually glass fibers doped with laser-active rare-earth elements, called the active fiber. Currently, the application fields of fiber lasers are extraordinarily broad, including Fiber Communication, Laser Processing(Cutting, Marking), Defense Facilities, Medical Equipment, and the pumping source of other laser systems, etc.

Besides the active fibers, there are lots of other essential optical components for fiber lasers. Optical Isolators are one of the vital constituents for fiber laser systems. Their function is to reduce the detrimental feedback and backward reflection into the fiber laser cavity. The most fundamental optical element for an optical isolator is the Faraday Rotator, which changes the polarization state of light as it is transmitted through a media with certain magneto-optic properties when an external magnetic field is applied. Hangzhou Shalom EO offers TGG (Terbium Gallium Garnet) Crystals and TSAG (Terbium Scandium Aluminum Garnet) Crystals both in laser-grade polished versions and as ingots. The crystals feature high Verdet constants, low absorption, and high power-handling abilities, requisite for manufacturing Faraday rotators.

In addition to the crystals, Shalom EO also provides other fiber laser components including Fiber End Caps for QBH (Quartz Block Head), Beam Combiners, and Various Fiber Laser Optics (C-Lens, Fast Axis Collimator, Slow Axis Collimator, etc). The end caps are oriented for the termination processing at the interface of air and the fiber using beam expansion. Shalom's fiber end caps are made from Fused Silica, N-BK7, and various custom glass material with AR coatings. The end caps are all colorless, which enables even beam expansion in homogeneous media. Our beam combiners consist of a polarization beam splitter cube and a waveplate optically contacted or cemented to the PBS. The C-lenses are lenses with a special surface profile, functioning as beam collimators, circulators, or focusing components for fiber lasers. Fast Axis Collimators (FAC-Lenses) and Slow Axis Collimators (SAC-Lenses) for collimating divergent light from diode lasers and laser bars along the fast axis or the slow axis are offered in custom versions.

C-Lens



- Substrate Materials: UV Fused Silica or N-BK7
- Low Insertion Loss and Low Cost
- High capability to Working Distance
- AR Coatings available
- Ideal as collimators, circulators, and isolators for fiber lasers

C-Lens is a kind of lens with a special designed surface profile oriented for fiber lasers. The lenses could function as beam collimators, circulators, or other focusing sub-components. One of the most prevalent usages of c-lens is to collimate point light sources to parallel lights, coupling light between different sections (e.g. diode to fiber, fiber to planar waveguide, etc.). In comparison with other lenses, (e.g. Grin-Lens), C-lens has a constant refractive index and excels in low insertion loss, low cost at long working distances, and excellent capability to handle broad working areas.

Hangzhou Shalom EO offers custom C-lens made from Fused Silica or N-BK7 for fiber laser applications. Our C-lenses are rod lenses with a spherical surface at one terminal and an inclined wedge plane at the other terminal designed to transform a single-mode fiber laser into a collimated beam with low insertion loss, or in turn, couple a collimated beam into a fiber. Shalom EO's C-lenses exhibit exquisite resistance to high power and chemical substances, in addition to a high refractive index in optical fiber communication spectral bandwidth. Both two ends are furnished with anti-reflection coatings to ensure high transmission and efficient power output.

Specifications:

Diameters	Φ1.0mm, Φ1.4mm,Φ1.8mm, Φ2.8mm, Φ3.5mm, etc.	Working Wavelength Range	400-700nm; 900-1100nm; 1250-1650nm; 2000nm, etc.
Surface Quality (S/D)	60/40, 40/20, 20/10, 10/5	Wedge Angle	0°, 5°, 6°, 8°, etc.
Surface Flatness	λ/2, λ/4, λ/8, etc.	Curvature Radius	0.6mm, 1.0mm, 1.419mm, 1.475mm, 1.8mm, 2.5mm, 4.0mm, or custom

Fiber End Caps



- Slight beam distortion and low echo-reflection
- High Damage Threshold ideal for high power fiber laser
- Various Materials: Quartz, Fused Silica, or other custom glass materials
- A stem or a tapered lead-in section for ease of splicing
- AR coatings furnished

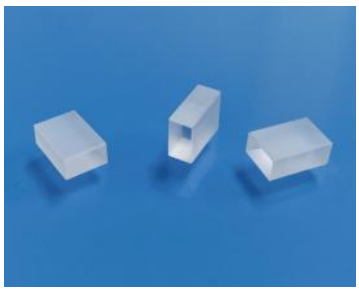
Fiber End caps are optical components designed for the end-face processing of fiber laser and fiber amplifiers with high average power at the interface of glass to air. The power could be so intense at the junction of fiber and air due to the minor crossectional area of the fiber, that strong heating and scorching could still devastate the fiber optic. Fiber end caps extend the crossectional area at the end faces of the fibers and therefore help to enhance the output power limit of fiber laser, reducing the power densities at the terminals within endurable bounds without causing damage using beam expansion so that the fiber component will not be injured.

Hangzhou Shalom EO offers Fiber End Caps made from Quartz or Fused Silica, and various custom glass materials with custom AR coatings. Our fiber end caps are colorless, which enables even beam expansion in homogeneous media. The end caps introduce a slight beam distortion and have a high damage threshold. Our fiber end caps could have either a stem or a tapered lead-in section with a special inclined angle at one terminal of the cap to help splice into the fiber. Shalom EO's fiber end caps also excel in minimized power absorptions, high precisions, and outstanding laser-induced damage thresholds. With these merits, our fiber end caps become attractive alternatives for clients seeking products with competitive prices in the market and reliable performance in the long run.

Specifications:

Materials	Optical Glass (Custom)	Working Wavelength Range	Custom
Coating	Uncoated, 1064nm, or Custom	Clear Aperture	>80%
Surface Flatness(@633nm)	≤λ/10	Surface Quality	10/5 S/D
Absorption	<1 ppm	Damage Threshold(CW)	>87kw/cm@1070nm
Surface Flatness	λ/4	Damage Threshold(Pulsed)	>102J/cm^2@1064nm
Angle Tolerance	<0.1°	Numerical Aperture	0.8
Parallelism	<1 arc min		

TSAG Crystals





- Greater Verdet constant (48 radT^-1m^-1 at 1064 nm), which is 20% higher than that of TGG Crystals
- Low absorption, which is 30% less than that of TGG
- Outstanding thermal properties and compelling mechanical characteristics
- ideal for high-power lasers and compact designs
- Precision polishing and AR coatings available

TSAG Crystal, or Terbium Scandium Aluminium Garnet Crystal is a superb magneto-optical material for manufacturing Faraday Optical Isolators of next-generation Fiber Lasers. A Faraday isolator is a critical optical element to mitigate the undesirable feedback in lasers with continuous waves and repetitive pulses which contribute to detrimental thermal effects. TSAG crystals are a prevalent kind of media to manufacture Faraday isolators. TSAG crystal is a newly developed crystal and exhibits stronger functionalities than the TGG crystal. The Verdet constants, the parameter which indicates the material's strength to induce Faraday rotation, of TSAG crystals are impressive, in addition to low thermal-induced birefringence and compelling mechanical characteristics. These virtues in conjunction make TSAG crystals a capable candidate for lasers with high average power, meanwhile allowing compact designs. With its transmission range spanning broadly from 400nm to 1600nm, TSAG is requisite for lasers operating in the VIS and NIR zone. Besides, TSAG crystals could also be utilized as scintillators, such as integrated radiation detectors or scintillation screens.

Hangzhou Shalom EO offers Czochralski-grown precision-polishing TSAG Crystals for Optical Isolators, Faraday Rotators, and Circulators. The Crystals are of superior surface quality (10/5 S/D) and furnished with transmission rate AR coatings. We are capable to grow TSAG crystals with large apertures and distinguished qualities.

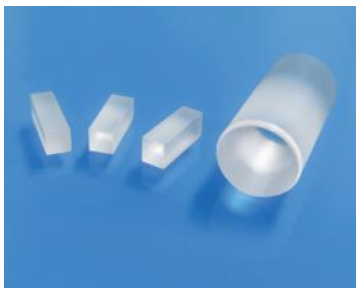
Specifications:

Orientation	Within ±15 arc min	Extinction Ratio	>30dB
Length Tolerance	±0.2mm	Diameter Tolerance	+0mm/-0.05mm
Surface Flatness	<λ/10@633nm	Surface Quality	10/5 S/D
Wavefront Distortion	<λ/8	Parallelism	3 arc min
Perpendicularity	<5 arc min	AR Coating	Ravg0.3% @1064nm
Chamfer	0.1mm, 45°		

Material Properties:

Transmittance Range(Bulk/Uncoated)	400-1600nm	Chemical Formula	Tb3Sc2Al3O12
Growth Method	Czochralski Method	Melting Temperature	1970°C±10°C
Material Density	5.91g/cm3	Lattice Constant	12.3angstrom
Crystalline Structure	Cubic		

TGG Crystals





- Large Verdet constant (~40 Rad T^-1m^-1)
- Low optical losses (<0.1%/cm)
- High thermal conductivity and High damage threshold (>1GW/cm2)
- Transmission range 400-1100nm, excluding 475-500nm
- Precision-polish and high-transmission AR coating

TGG Crystal, or Terbium Gallium Garnet Crytal, chemical composition TbGa5O12, is the most prevalent and common magneto-optical material used to manufacture Faraday rotators and various magneto-optical components, with its transmission range from visible to near-infrared (400-1100nm, excluding 475-500nm). Through locating a TGG crystal in a magnetic field, a Faraday rotator in which a non-reciprocal rotation of polarization is introduced could be obtained. And this rotation in polarization is the principle of an optical isolator. And with its function of rotation on the polarization plane, a lot of optical devices, besides isolators, could also be contrived, such as magneto-optical modulators, circulators, current measuring transducers, etc.

As an excellent kind of magneto-optical crystal, TGG features a large Verdet constant(~40 Rad T^-1 m^-1), superb thermal properties (thermal conductivity 7.4w/m/k), low optical losses (<0.1%/cm), and high laser-induced damage thresholds(>1 GW/cm2). These advantages in total make TGG crystals perform better when coping with high average power fiber lasers than terbium-doped glasses in terms of greater Verdet constant and lower optical losses.

Hangzhou Shalom EO offers Czochralski-grown, precision-polished Terbium Gallium Garnet (TGG) Crystals with high surface quality (10/5 S/D) and high transmission AR Coatings, realizing strong magneto-optical effects with effective light-blocking functions in the lasers meanwhile ensuring small optical loss.

Specifications:

Orientation	[111}Within ±15'	Extinction Ratio	>30dB
Length Tolerance	±0.2mm	Diameter Tolerance	±0.1mm
Surface Flatness	<λ/8@633nm	Surface Quality	10/5 S/D
Wavefront Distortion	<λ/8@633nm	Parallelism	20 arc sec
Perpendicularity	≤15 arc min	AR Coating	Ravg0.2% @1064nm
Chamfer	≤0.2mmx45°		

Material Properties:

Chemical Formula	Tb3Ga5O12	Lattice Constant	a=12.355angstrom
Growth Method	Czochralski Method	Melting Temperature	1725°C
Material Density	7.13g/cm3	Mohs Hardness	8
Refractive Index	1.954@1064nm		

Polarization Beam Combiner



- Substrate Materials: Custom Glass Materials
- Low Scatter and Efficient Collimation
- Mechanical Durability
- AR Coatings furnished
- Ideal for: High Power Laser Bars and Stacks, Fiber-Coupled Direct Diode, Solid State Laser Pumping, etc

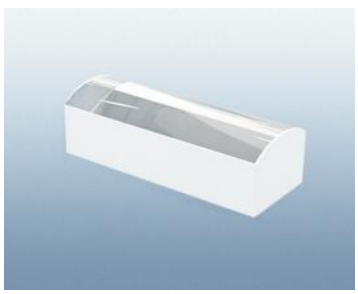
Slow Axis Collimators (SAC-Lenses) axis collimators are optical components used in lasers, often in diode lasers, to shape and control the output beam. Slow-axis collimators are designed to reduce the divergence angle along the slow axis of asymmetric beam emission from diode lasers, leading to a more symmetrical output beam profile. The aspheric design of the SAC lenses results in low spherical aberrations and therefore efficient collimation of the slow-axis dimensions.

Hangzhou Shalom EO offers Custom Slow Axis Collimators (SAC-lenses) with high-precision fabrication which contributes to low scattering and crosstalk and AR coatings. We implement a strict inspection procedure in our clean house, where we strive to minimize the deviation between the published standards and the actual qualities. The products are compatible with various laser bars and laser stacks and capable of handling high power densities. Flexible custom designs could be tailored upon request. Combined usage with our Fast-Axis-Collimators is recommendable.

Specifications:

Materials	N-BK7/H-K9/N-SF11/UV Fused Silica/Corning 7980/Single Crystal Quartz/MgF2	Side Lengths	0.8mm, 1mm, 3mm, 5mm, 10mm, 20mm, 30mm, etc.
Working Wavelengths	400-700nm; 808nm; 1064; 1310; 1490; 1550nm; 2000nm, etc.	Coatings	AR Coating, Beamsplitter Coating, Au AR Coating, Ag AR Coating, Al AR Coating
Surface Quality	10/5, 20/10, 40/20, 60/40	Surface Flatness	λ/2, λ/4, λ/8, λ/10, etc.
Beam Deviation Angle	±10″, ±30″, ±1′		

Slow Axis Collimator (SAC-Lens)



- Substrate Materials: Custom Glass Materials
- Low Scatter and Efficient Collimation
- Mechanical Durabilities
- AR Coatings furnished
- Ideal for: High Power Laser Bars and Stacks, Fiber-Coupled Direct Diode, Solid State Laser Pumping, etc

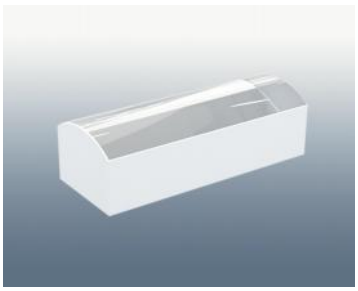
Slow Axis Collimators (SAC-Lenses) are optical lenses that generate laser beams in the slow-axis direction in laser diodes. The slow-axis collimators could either consist of a monolithic line of rod-shaped micro-lenses or a single lens when collimating a single emitter. The aspheric design of the SAC lenses results in low spherical aberrations and therefore efficient collimation of the slow-axis dimensions.

Hangzhou Shalom EO offers Custom Slow Axis Collimators (SAC-lenses) with high-precision fabrication which contributes to low scattering and crosstalk and AR coatings. The products are compatible with various laser bars and laser stacks and capable of handling high power densities. Flexible custom designs could be tailored upon request. Combined usage with our Fast-Axis-Collimators is also recommendable.

Specifications:

Materials	Optical Glass	Coating Wavelength Range	790-990nm or Custom
Coating	BBAR Coating (790-990nm)	Coating Specification	Ravg<1.0%@790-990nm
Design Wavelength	808nm	Height Tolerance	±0.05mm
Length Tolerance	±0.05mm	Dimension	Custom
Surface Flatness	λ/4	Pitch	500μm
Transmission	>99%	Clear Aperture	Custom

Fast Axis Collimator (FAC-Lens)



- Micro-cylindrical aspheric form
- Substrate Materials: Custom Glass Materials
- High beam quality and uniform collimation
- AR Coatings furnished
- Custom Dimensions and EFL

Fast Axis Collimator (FAC-Lens) is a compact optical lens designed for collimating spreading light beams from a Diode Laser along the fast axis. The FAC lens collimates the diverging light from the laser diode into a concentrated narrow linewidth and adjusts the beam profile. A fast axis collimator is the most important component in high-power diode lasers since its large numerical apertures (NA) make it possible to collimate all portions of diode output with excellent beam qualities. The greatest altitudes of beam shaping effectiveness for diode lasers are assured through the high transmission and good collimation properties. Our fast-axis collimators feature an aspheric surface and a high numerical aperture to compensate for the large divergence angle of the laser diode in the fast-axis direction, achieving high beam qualities and uniform collimation.

Hangzhou Shalom offers a custom Fast Axis Collimator (FAC) lens of high-precision fabrication and with AR Coatings, within the working wavelength range, our fast axis collimator supports an eminent optical transmission greater than 99%. Various glass substrate materials are available for selection, while the dimensions and Effective Focal Length (EFL) of the lenses are also broadly accessible.

Specifications:

Materials	Optical Glass	Coating Wavelength Range	790-990nm, or Custom
Coating	BBAR Coating (790-990nm)	Coating Specification	Ravg<1.0%@790-990nm
Design Wavelength	808nm	Height Tolerance	±0.05mm
Length Tolerance	±0.05mm	Dimension	Custom
Surface Flatness	λ/4	Width Tolerance	±0.01mm
Transmission	>99%	Numerical Aperture	0.8
Collimation Power	>80% within 1.15xDIV; >85% within 1.30xDIV		

Modules and Types:

Type	FAC300	FAC360	FAC600
Effective focal length EF[um]	300+70@940nm	360+70@940nm	600+70@940nm
Black focal length BFL[um]	70±30@940nm	70±30@940nm	140±30@940nm
Residual divergence@X% power enclosure [mrad]	±2.50 @85%	±2.00@85%	±1.50@85%
Numerical Aperture (Design)	0.8	0.8	0.8
Wavelength [nm]	780-1000/430-470	780-1000	780-1000
Broadband AR-Coating Reflexion avg. (AOI) [%]	Ra<= 0.4 (0° -35°)	Ra<= 0.4 (0° -35°)	Ra<= 0.4 (0° -35°)
Coating Durability	MIL-C-675	MIL-C-675	MIL-C-675
Dimensions (Height x Thicknessx Length) [mm]	0.5 ±0.05 x 0.43±0.03x 4.0±0.05	0.6±0.05 x0.53±0.03x4.0±0.05	1.0±0.05x 0.82 ±0.03x 4.0 ±0.05
S1 Clear Aperture (Heightx Length) [mm]	0.3x3.5	0.3x3.5	0.3x3.5
S1 Surface Imperfections (acc. MIL-PRF-13830B)	20—10	20—10	20—10
S2 Clear Aperture (Height x Length) [mm]	0.4x 3.5	0.5x3.5	0.9x3.5
S2 Surface Imperfections (acc. MIL-PRF-13830B)	20—10	20—10	20—10
Edge Chipping [mm]	0.1	0.1	0.1

02 Optical Components

Optical Components

Optical Components are fundamental optical elements to construct optical devices and systems, functioning to converge/diverge, filter, reflect, and alter the polarization states of light. By understanding and harnessing the properties of light waves, optical components can control the propagation, direction, polarization, and intensity of light with precision and accuracy. Optical components find versatile utilities in various applications, such as imaging, microscopes, testing, industrial manufacturing, medical, life science, communications, etc. Specific material substrates and thin film coatings are often selected with a deliberate contrivance to enhance the performance of optical components.

Hangzhou Shalom EO supplies a vast selection of off-the-shelf and custom optical components. This catalog features our Optical Lenses, Optical Windows, Optical Mirrors, Optical Prisms, Laser-grade Optics, Superpolished Optics, Sapphire Optics, and Optics for IPL Devices with a wide operation wavelength range from UV, VIS, to IR. Hundreds of off-the-shelf optical components are available in our online shop in addition to a large access of custom optical components.

The design, fabrication, and characterization of optical components require expertise in optics, materials science, and precision engineering. Hangzhou Shalom EO Implement stringent quality control of the ingredient materials (e.g. by sourcing our materials from elite manufacturers like Corning, SCHOTT, etc.) to overcome challenges of robustness, chemical resistance, and thermal endurance in extreme working conditions. With advanced production facilities, cutting-edge production technologies (like ultrafast-enhanced coating, super-polishing, Kyropoulos Sapphire growth method), and forefront designing intelligence, Shalom EO's engineers and production line are competent at and committed to endowing our optical components with the optimized optical excellence to enable the flexible manipulation of light. All the products will go through in-process inspections during the production course and further tests before despatch to ensure the parameters of optical components meet or exceed the published specifications, prioritizing our consumers' interests.



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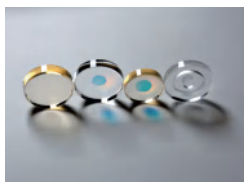

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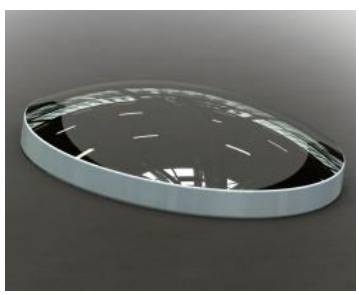
Optical Lenses



Optical Lenses are optical components that are transparent to certain light spectrums, and oriented for either collecting or diverging light. The functions of optical lenses encompass laser processing, image magnification, fiber collimation, etc. and the applications of optical lenses are extensive, ranging from life science, and medical diagnoses, to defense and industrial production.

Hangzhou Shalom EO offers Stocked and Custom Optical Lenses, including Plano-convex, Plano-concave, Double Convex/Concave Lenses, Meniscus Lenses, Achromatic Doublet Lenses, Ball/Half Ball Lenses, Cylinderical Lenses, Rod Lenses, Axicons, and Aspheric Lenses. The substrate materials include N-BK7, UV Fused Silica, Flint Glass, and Sapphire, while for Infrared wavelengths Germanium (Ge), Zinc Selenide (ZnSe) and Silicon (Si), etc. are also available. All categories of lenses could be deposited with anti-reflection coatings according to your requirements. Hangzhou Shalom EO is a leading supplier of optical lenses. With over ten years of experience, we have developed our high-tech production line and in-house ISO9001-compliant inspection labs to ensure the quality of our products before dispatch.

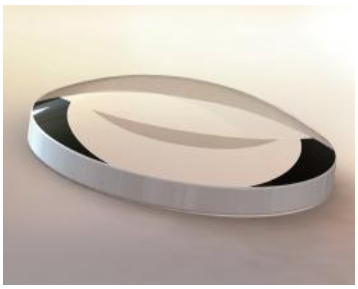
Plano-Convex Lenses

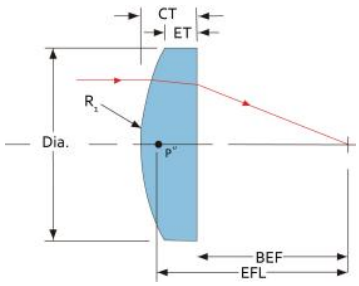


Plano-convex (PCX) lens is an optical lens with one plane face and one convex face, and a positive focal length, utilized for collecting, focusing collimated lights, collimating lights from a point source, or reducing the focal length of a lens group. Compared to Biconvex lenses, Plano-convex lenses have two unidentical sides and therefore work best for an infinite absolute conjugate ratio (objective distance: image distance). However, plano-convex lenses still reduce spherical aberrations to a quite low extent when the absolute conjugate ratio is greater than 5:1. For conjugate ratio below 5:1, consider using plano-convex lenses in pairs or a biconvex lens.

Hangzhou Shalom EO offers Stocked and Custom Plano-convex Lenses. While you can browse and shop Off-the-Shelf N-BK7 Plano Convex Lenses, Off-the-Shelf UVFS Plano Convex Lenses, Off-the-Shelf CaF2 Plano Convex Lenses, we also provide custom plano convex lenses made from a wide assortment of optical materials including sapphire, Flint Glass/BaF2/Ge/Si, etc. that are competent for various incorporation into emitters, detectors, imaging instruments, lasers, fiber optics, etc. Our N-BK7 plano-convex lens features a diameter of 6-75mm, and a focal length of 10-1000mm, while other dimensions and focal lengths could be customized. These lenses feature lambda/4 irregularities and 40/20 scratch/dig. The UV Fused Silica plano-convex lenses highlight a high-precision version of lambda/10 irregularities and 10/5 S/D, or a normal version of lambda/4 irregularities and 40/20 S/D, the glass materials are sourced from Corning (Corning 7980-0F, Corning 7980-1D). Our CaF2 plano-convex lenses (standard) have diameters ranging from 12.7mm to 25.4mm and focal lengths ranging from 20mm to 1000mm, encompassing short focal lengths, mid-focal lengths, and long focal lengths. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch to secure your interest. Our inspection procedure includes an in-process checking stage of the optical properties of lenses and a final test of coatings, dimension precisions, and the visual observation of scratch/dig, apertures, inclusions, etc.

λ/4-λ N-BK7 Plano-convex Lenses





- Wavelength range: 350-2200nm
- Diameter range: 0.5mm to 300mm
- Standardized focal lengths and diameters convenient for OEM
- Ideal for various applications in the visible to NIR region
- Coating options: standard uncoated and BBAR coatings, custom broadband AR coatings, V-coatings
- A wide range of focal lengths: Standard 10-1000mm, or custom
- Versatile Applications: detectors, imaging instruments, lasers, fiber optics, etc.

N-BK7 glass is a RoHS-compliant borosilicate material prevalent for uses in the visible and NIR spectrum (especially when it comes to manufacturing precision visible components). N-BK7 features high optical homogeneities, great resistance to scratches and abrasions, low cost, and low inclusion content, it is an ideal substitute for UV Fused Silica when high UV transmission is not required, and a preferred alternative for CaF2 at the 1.65-2.3 micro-operating wavelength region with the concern of lower manufacturing costs.

Hangzhou Shalom EO offers Stocked and Custom N-BK7 Plano-convex Lenses with a diameter range of 0.5-300mm, that allows for flexible incorporation into emitters, detectors, imaging instruments, lasers, fiber optics, etc. Our N-BK7 plano-convex lenses have a wide optional diameter range of 6-75mm, and a focal length range of 10-1000mm, while other dimensions and focal lengths could be customized. These lenses feature λ/4-λ irregularities and 40/20 scratch/dig. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch to secure your interest. Our inspection procedure includes an in-process checking stage of the optical properties of lenses and a final test of coatings, dimension precisions, and the visual observation of scratch/dig, apertures, inclusions, etc.

Specifications:

Material	N-BK7
Design Wavelength	587.6nm
Coating	Uncoated/BBAR
Surface Quality (S/D)	40/20
Irregularity@632.8nm	λ/4-λ
Centering Error	≤2 arc min
Clear Aperture	90%
Protective Chamfer	0.2mmx45°
Diameter Tolerance	+0/-0.1mm
Thickness Tolerance	+/-0.1mm

Product List of λ/4-λ N-BK7 Plano-convex Lenses

Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1101-065	N-BK7	6.0mm	2.5mm	1.5mm	10.0mm	Uncoated	$11.00
1101-115	N-BK7	6.0mm	2.5mm	1.5mm	10.0mm	350-650nm AR Coating	$17.00
1101-116	N-BK7	6.0mm	2.5mm	1.5mm	10.0mm	650-1050nm AR Coating	$17.00
1101-117	N-BK7	6.0mm	2.5mm	1.5mm	10.0mm	1050-1580nm AR Coating	$19.00
1101-066	N-BK7	6.0mm	2.3mm	1.5mm	12.0mm	Uncoated	$11.00
1101-118	N-BK7	6.0mm	2.3mm	1.5mm	12.0mm	350-650nm AR Coating	$17.00
1101-119	N-BK7	6.0mm	2.3mm	1.5mm	12.0mm	650-1050nm AR Coating	$17.00
1101-120	N-BK7	6.0mm	2.3mm	1.5mm	12.0mm	1050-1580nm AR Coating	$19.00
1101-067	N-BK7	6.0mm	2.1mm	1.5mm	15.0mm	Uncoated	$11.00
1101-121	N-BK7	6.0mm	2.1mm	1.5mm	15.0mm	350-650nm AR Coating	$17.00

Product List of λ/4-λ N-BK7 Plano-convex Lenses

Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1101-122	N-BK7	6.0mm	2.1mm	1.5mm	15.0mm	650-1050nm AR Coating	$17.00
1101-123	N-BK7	6.0mm	2.1mm	1.5mm	15.0mm	1050-1580nm AR Coating	$19.00
1101-068	N-BK7	6.0mm	1.8mm	1.5mm	30.0mm	Uncoated	$11.00
1101-124	N-BK7	6.0mm	1.8mm	1.5mm	30.0mm	350-650nm AR Coating	$17.00
1101-125	N-BK7	6.0mm	1.8mm	1.5mm	30.0mm	650-1050nm AR Coating	$17.00
1101-126	N-BK7	6.0mm	1.8mm	1.5mm	30.0mm	1050-1580nm AR Coating	$19.00
1101-069	N-BK7	9.0mm	3.4mm	1.5mm	12.0mm	Uncoated	$11.00
1101-127	N-BK7	9.0mm	3.4mm	1.5mm	12.0mm	350-650nm AR Coating	$17.00
1101-128	N-BK7	9.0mm	3.4mm	1.5mm	12.0mm	650-1050nm AR Coating	$17.00
1101-129	N-BK7	9.0mm	3.4mm	1.5mm	12.0mm	1050-1580nm AR Coating	$19.00
1101-070	N-BK7	9.0mm	2.5mm	1.5mm	20.0mm	Uncoated	$11.00
1101-130	N-BK7	9.0mm	2.5mm	1.5mm	20.0mm	350-650nm AR Coating	$17.00
1101-131	N-BK7	9.0mm	2.5mm	1.5mm	20.0mm	650-1050nm AR Coating	$17.00
1101-132	N-BK7	9.0mm	2.5mm	1.5mm	20.0mm	1050-1580nm AR Coating	$19.00
1101-071	N-BK7	12.7mm	5.1mm	1.8mm	15.0mm	Uncoated	$11.00
1101-133	N-BK7	12.7mm	5.1mm	1.8mm	15.0mm	350-650nm AR Coating	$17.00
1101-134	N-BK7	12.7mm	5.1mm	1.8mm	15.0mm	650-1050nm AR Coating	$17.00
1101-135	N-BK7	12.7mm	5.1mm	1.8mm	15.0mm	1050-1580nm AR Coating	$19.00
1101-001	N-BK7	12.7mm	4.5mm	2.3mm	20.0mm	Uncoated	$13.50
1101-002	N-BK7	12.7mm	4.5mm	2.3mm	20.0mm	400-700nm AR	$21.00
1101-003	N-BK7	12.7mm	4.5mm	2.3mm	20.0mm	700-1100nm AR	$21.00
1101-004	N-BK7	12.7mm	4.5mm	2.3mm	20.0mm	1100-1650nm AR	$21.00
1101-072	N-BK7	12.7mm	3.5mm	1.8mm	25.0mm	Uncoated	$11.00
1101-136	N-BK7	12.7mm	3.5mm	1.8mm	25.0mm	350-650nm AR Coating	$17.00
1101-137	N-BK7	12.7mm	3.5mm	1.8mm	25.0mm	650-1050nm AR Coating	$17.00
1101-138	N-BK7	12.7mm	3.5mm	1.8mm	25.0mm	1050-1580nm AR Coating	$19.00
1101-005	N-BK7	12.7mm	3.5mm	2.1mm	30.0mm	Uncoated	$13.50
1101-006	N-BK7	12.7mm	3.5mm	2.1mm	30.0mm	400-700nm AR	$21.00
1101-007	N-BK7	12.7mm	3.5mm	2.1mm	30.0mm	700-1100nm AR	$21.00
1101-008	N-BK7	12.7mm	3.5mm	2.1mm	30.0mm	1100-1650nm AR	$21.00
1101-009	N-BK7	12.7mm	3.0mm	2.0mm	40.0mm	Uncoated	$13.50
1101-010	N-BK7	12.7mm	3.0mm	2.0mm	40.0mm	400-700nm AR	$21.00
1101-011	N-BK7	12.7mm	3.0mm	2.0mm	40.0mm	700-1100nm AR	$21.00
1101-012	N-BK7	12.7mm	3.0mm	2.0mm	40.0mm	1100-1650nm AR	$21.00
1101-013	N-BK7	12.7mm	3.0mm	2.2mm	50.0mm	Uncoated	$13.50
1101-014	N-BK7	12.7mm	3.0mm	2.2mm	50.0mm	400-700nm AR	$21.00
1101-015	N-BK7	12.7mm	3.0mm	2.2mm	50.0mm	700-1100nm AR	$21.00
1101-016	N-BK7	12.7mm	3.0mm	2.2mm	50.0mm	1100-1650nm AR	$21.00
1101-017	N-BK7	12.7mm	3.0mm	2.6mm	100.0mm	Uncoated	$13.50
1101-018	N-BK7	12.7mm	3.0mm	2.6mm	100.0mm	400-700nm AR	$21.00
1101-019	N-BK7	12.7mm	3.0mm	2.6mm	100.0mm	700-1100nm AR	$21.00
1101-020	N-BK7	12.7mm	3.0mm	2.6mm	100.0mm	1100-1650nm AR	$21.00
1101-073	N-BK7	18.0mm	7.1mm	1.8mm	20.0mm	Uncoated	$11.00
1101-139	N-BK7	18.0mm	7.1mm	1.8mm	20.0mm	350-650nm AR Coating	$17.00
1101-140	N-BK7	18.0mm	7.1mm	1.8mm	20.0mm	650-1050nm AR Coating	$17.00
1101-141	N-BK7	18.0mm	7.1mm	1.8mm	20.0mm	1050-1580nm AR Coating	$19.00
1101-074	N-BK7	18.0mm	5.5mm	1.8mm	25.0mm	Uncoated	$11.00
1101-142	N-BK7	18.0mm	5.5mm	1.8mm	25.0mm	350-650nm AR Coating	$17.00
1101-143	N-BK7	18.0mm	5.5mm	1.8mm	25.0mm	650-1050nm AR Coating	$17.00
1101-144	N-BK7	18.0mm	5.5mm	1.8mm	25.0mm	1050-1580nm AR Coating	$19.00
1101-075	N-BK7	18.0mm	4.7mm	1.8mm	30.0mm	Uncoated	$11.00
1101-145	N-BK7	18.0mm	4.7mm	1.8mm	30.0mm	350-650nm AR Coating	$17.00
1101-146	N-BK7	18.0mm	4.7mm	1.8mm	30.0mm	650-1050nm AR Coating	$17.00
1101-147	N-BK7	18.0mm	4.7mm	1.8mm	30.0mm	1050-1580nm AR Coating	$19.00
1101-076	N-BK7	18.0mm	3.4mm	1.8mm	50.0mm	Uncoated	$11.00
1101-148	N-BK7	18.0mm	3.4mm	1.8mm	50.0mm	350-650nm AR Coating	$17.00
1101-149	N-BK7	18.0mm	3.4mm	1.8mm	50.0mm	650-1050nm AR Coating	$17.00
1101-150	N-BK7	18.0mm	3.4mm	1.8mm	50.0mm	1050-1580nm AR Coating	$19.00
1101-077	N-BK7	25.0mm	11.7mm	2.0mm	25.4mm	Uncoated	$12.00
1101-151	N-BK7	25.0mm	11.7mm	2.0mm	25.4mm	350-650nm AR Coating	$18.50
1101-152	N-BK7	25.0mm	11.7mm	2.0mm	25.4mm	650-1050nm AR Coating	$18.50
1101-153	N-BK7	25.0mm	11.7mm	2.0mm	25.4mm	1050-1580nm AR Coating	$19.00
1101-078	N-BK7	25.0mm	5.3mm	2.1mm	50.0mm	Uncoated	$12.00
1101-154	N-BK7	25.0mm	5.3mm	2.1mm	50.0mm	350-650nm AR Coating	$18.50

Product List of λ/4-λ N-BK7 Plano-convex Lenses

Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1101-155	N-BK7	25.0mm	5.3mm	2.1mm	50.0mm	650-1050nm AR Coating	$18.50
1101-156	N-BK7	25.0mm	5.3mm	2.1mm	50.0mm	1050-1580nm AR Coating	$19.00
1101-079	N-BK7	25.0mm	4.1mm	2.0mm	75.0mm	Uncoated	$12.00
1101-157	N-BK7	25.0mm	4.1mm	2.0mm	75.0mm	350-650nm AR Coating	$18.50
1101-158	N-BK7	25.0mm	4.1mm	2.0mm	75.0mm	650-1050nm AR Coating	$18.50
1101-159	N-BK7	25.0mm	4.1mm	2.0mm	75.0mm	1050-1580nm AR Coating	$19.00
1101-080	N-BK7	25.0mm	3.6mm	2.1mm	100.0mm	Uncoated	$13.00
1101-160	N-BK7	25.0mm	3.6mm	2.1mm	100.0mm	350-650nm AR Coating	$19.50
1101-161	N-BK7	25.0mm	3.6mm	2.1mm	100.0mm	650-1050nm AR Coating	$19.50
1101-162	N-BK7	25.0mm	3.6mm	2.1mm	100.0mm	1050-1580nm AR Coating	$20.00
1101-081	N-BK7	25.0mm	2.8mm	2.0mm	200.0mm	Uncoated	$13.50
1101-163	N-BK7	25.0mm	2.8mm	2.0mm	200.0mm	350-650nm AR Coating	$20.00
1101-164	N-BK7	25.0mm	2.8mm	2.0mm	200.0mm	650-1050nm AR Coating	$20.00
1101-165	N-BK7	25.0mm	2.8mm	2.0mm	200.0mm	1050-1580nm AR Coating	$20.50
1101-082	N-BK7	25.4mm	11.7mm	1.8mm	25.4mm	Uncoated	$13.00
1101-166	N-BK7	25.4mm	11.7mm	1.8mm	25.4mm	350-650nm AR Coating	$19.50
1101-167	N-BK7	25.4mm	11.7mm	1.8mm	25.4mm	650-1050nm AR Coating	$19.50
1101-168	N-BK7	25.4mm	11.7mm	1.8mm	25.4mm	1050-1580nm AR Coating	$20.00
1101-083	N-BK7	25.4mm	8.6mm	2.0mm	30.0mm	Uncoated	$12.00
1101-169	N-BK7	25.4mm	8.6mm	2.0mm	30.0mm	350-650nm AR Coating	$18.50
1101-170	N-BK7	25.4mm	8.6mm	2.0mm	30.0mm	650-1050nm AR Coating	$18.50
1101-171	N-BK7	25.4mm	8.6mm	2.0mm	30.0mm	1050-1580nm AR Coating	$19.00
1101-084	N-BK7	25.4mm	7.2mm	2.0mm	35.0mm	Uncoated	$12.00
1101-172	N-BK7	25.4mm	7.2mm	2.0mm	35.0mm	350-650nm AR Coating	$18.50
1101-173	N-BK7	25.4mm	7.2mm	2.0mm	35.0mm	650-1050nm AR Coating	$18.50
1101-174	N-BK7	25.4mm	7.2mm	2.0mm	35.0mm	1050-1580nm AR Coating	$19.00
1101-085	N-BK7	25.4mm	6.4mm	2.0mm	40.0mm	Uncoated	$12.00
1101-175	N-BK7	25.4mm	6.4mm	2.0mm	40.0mm	350-650nm AR Coating	$18.50
1101-176	N-BK7	25.4mm	6.4mm	2.0mm	40.0mm	650-1050nm AR Coating	$18.50
1101-177	N-BK7	25.4mm	6.4mm	2.0mm	40.0mm	1050-1580nm AR Coating	$19.00
1101-021	N-BK7	25.4mm	5.0mm	1.7mm	50.0mm	Uncoated	$13.00
1101-022	N-BK7	25.4mm	5.0mm	1.7mm	50.0mm	400-700nm AR	$19.00
1101-023	N-BK7	25.4mm	5.0mm	1.7mm	50.0mm	700-1100nm AR	$19.00
1101-024	N-BK7	25.4mm	5.0mm	1.7mm	50.0mm	1100-1650nm AR	$21.00
1101-025	N-BK7	25.4mm	4.0mm	1.9mm	75.0mm	Uncoated	$13.00
1101-026	N-BK7	25.4mm	4.0mm	1.9mm	75.0mm	400-700nm AR	$19.00
1101-027	N-BK7	25.4mm	4.0mm	1.9mm	75.0mm	700-1100nm AR	$19.00
1101-028	N-BK7	25.4mm	4.0mm	1.9mm	75.0mm	1100-1650nm AR	$21.00
1101-029	N-BK7	25.4mm	3.5mm	1.9mm	100.0mm	Uncoated	$13.00
1101-030	N-BK7	25.4mm	3.5mm	1.9mm	100.0mm	400-700nm AR	$19.00
1101-031	N-BK7	25.4mm	3.5mm	1.9mm	100.0mm	700-1100nm AR	$19.00
1101-032	N-BK7	25.4mm	3.5mm	1.9mm	100.0mm	1100-1650nm AR	$21.00
1101-033	N-BK7	25.4mm	3.2mm	1.9mm	125.0mm	Uncoated	$13.00
1101-034	N-BK7	25.4mm	3.2mm	1.9mm	125.0mm	400-700nm AR	$19.00
1101-035	N-BK7	25.4mm	3.2mm	1.9mm	125.0mm	700-1100nm AR	$19.00
1101-036	N-BK7	25.4mm	3.2mm	1.9mm	125.0mm	1100-1650nm AR	$21.00
1101-037	N-BK7	25.4mm	3.0mm	2.0mm	150.0mm	Uncoated	$13.00
1101-038	N-BK7	25.4mm	3.0mm	2.0mm	150.0mm	400-700nm AR	$19.00
1101-039	N-BK7	25.4mm	3.0mm	2.0mm	150.0mm	700-1100nm AR	$19.00
1101-040	N-BK7	25.4mm	3.0mm	2.0mm	150.0mm	1100-1650nm AR	$21.00
1101-086	N-BK7	25.4mm	2.9mm	2.0mm	175.0mm	Uncoated	$13.50
1101-178	N-BK7	25.4mm	2.9mm	2.0mm	175.0mm	350-650nm AR Coating	$20.00
1101-179	N-BK7	25.4mm	2.9mm	2.0mm	175.0mm	650-1050nm AR Coating	$20.00
1101-180	N-BK7	25.4mm	2.9mm	2.0mm	175.0mm	1050-1580nm AR Coating	$20.50
1101-041	N-BK7	25.4mm	3.0mm	2.2mm	200.0mm	Uncoated	$15.00
1101-042	N-BK7	25.4mm	3.0mm	2.2mm	200.0mm	400-700nm AR	$21.00
1101-043	N-BK7	25.4mm	3.0mm	2.2mm	200.0mm	700-1100nm AR	$21.00
1101-044	N-BK7	25.4mm	3.0mm	2.2mm	200.0mm	1100-1650nm AR	$21.00
1101-087	N-BK7	25.4mm	2.6mm	2.0mm	250.0mm	Uncoated	$15.00
1101-181	N-BK7	25.4mm	2.6mm	2.0mm	250.0mm	350-650nm AR Coating	$21.00
1101-182	N-BK7	25.4mm	2.6mm	2.0mm	250.0mm	650-1050nm AR Coating	$21.00
1101-183	N-BK7	25.4mm	2.6mm	2.0mm	250.0mm	1050-1580nm AR Coating	$21.00
1101-045	N-BK7	25.4mm	3.0mm	2.5mm	300.0mm	Uncoated	$15.00
1101-046	N-BK7	25.4mm	3.0mm	2.5mm	300.0mm	400-700nm AR	$21.00

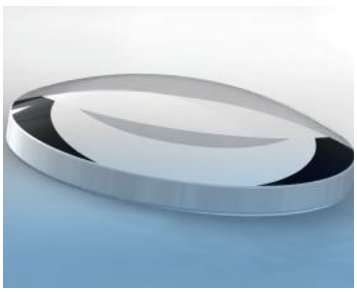
Product List of λ/4-λ N-BK7 Plano-convex Lenses

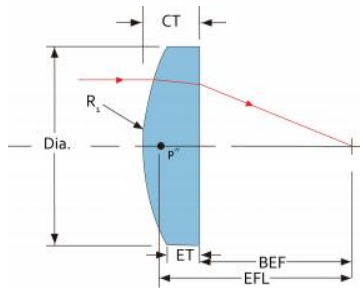
Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1101-047	N-BK7	25.4mm	3.0mm	2.5mm	300.0mm	700-1100nm AR	$21.00
1101-048	N-BK7	25.4mm	3.0mm	2.5mm	300.0mm	1100-1650nm AR	$21.00
1101-049	N-BK7	25.4mm	3.0mm	2.6mm	400.0mm	Uncoated	$15.00
1101-050	N-BK7	25.4mm	3.0mm	2.6mm	400.0mm	400-700nm AR	$21.00
1101-051	N-BK7	25.4mm	3.0mm	2.6mm	400.0mm	700-1100nm AR	$21.00
1101-052	N-BK7	25.4mm	3.0mm	2.6mm	400.0mm	1100-1650nm AR	$21.00
1101-053	N-BK7	25.4mm	3.0mm	2.7mm	500.0mm	Uncoated	$15.00
1101-054	N-BK7	25.4mm	3.0mm	2.7mm	500.0mm	400-700nm AR	$21.00
1101-055	N-BK7	25.4mm	3.0mm	2.7mm	500.0mm	700-1100nm AR	$21.00
1101-056	N-BK7	25.4mm	3.0mm	2.7mm	500.0mm	1100-1650nm AR	$21.00
1101-057	N-BK7	25.4mm	3.0mm	2.8mm	750.0mm	Uncoated	$15.00
1101-058	N-BK7	25.4mm	3.0mm	2.8mm	750.0mm	400-700nm AR	$21.00
1101-059	N-BK7	25.4mm	3.0mm	2.8mm	750.0mm	700-1100nm AR	$21.00
1101-060	N-BK7	25.4mm	3.0mm	2.8mm	750.0mm	1100-1650nm AR	$21.00
1101-061	N-BK7	25.4mm	3.0mm	2.8mm	1000.0mm	Uncoated	$15.00
1101-062	N-BK7	25.4mm	3.0mm	2.8mm	1000.0mm	400-700nm AR	$21.00
1101-063	N-BK7	25.4mm	3.0mm	2.8mm	1000.0mm	700-1100nm AR	$21.00
1101-064	N-BK7	25.4mm	3.0mm	2.8mm	1000.0mm	1100-1650nm AR	$21.00
1101-088	N-BK7	30.0mm	9.0mm	2.5mm	40.0mm	Uncoated	$12.00
1101-184	N-BK7	30.0mm	9.0mm	2.5mm	40.0mm	350-650nm AR Coating	$18.50
1101-185	N-BK7	30.0mm	9.0mm	2.5mm	40.0mm	650-1050nm AR Coating	$18.50
1101-186	N-BK7	30.0mm	9.0mm	2.5mm	40.0mm	1050-1580nm AR Coating	$19.00
1101-089	N-BK7	30.0mm	7.3mm	2.5mm	50.0mm	Uncoated	$12.00
1101-187	N-BK7	30.0mm	7.3mm	2.5mm	50.0mm	350-650nm AR Coating	$18.50
1101-188	N-BK7	30.0mm	7.3mm	2.5mm	50.0mm	650-1050nm AR Coating	$18.50
1101-189	N-BK7	30.0mm	7.3mm	2.5mm	50.0mm	1050-1580nm AR Coating	$19.00
1101-090	N-BK7	30.0mm	5.5mm	2.5mm	75.0mm	Uncoated	$12.00
1101-190	N-BK7	30.0mm	5.5mm	2.5mm	75.0mm	350-650nm AR Coating	$18.50
1101-191	N-BK7	30.0mm	5.5mm	2.5mm	75.0mm	650-1050nm AR Coating	$18.50
1101-192	N-BK7	30.0mm	5.5mm	2.5mm	75.0mm	1050-1580nm AR Coating	$19.00
1101-091	N-BK7	30.0mm	4.7mm	2.5mm	100.0mm	Uncoated	$13.00
1101-193	N-BK7	30.0mm	4.7mm	2.5mm	100.0mm	350-650nm AR Coating	$19.50
1101-194	N-BK7	30.0mm	4.7mm	2.5mm	100.0mm	650-1050nm AR Coating	$19.50
1101-195	N-BK7	30.0mm	4.7mm	2.5mm	100.0mm	1050-1580nm AR Coating	$20.00
1101-092	N-BK7	30.0mm	4.3mm	2.5mm	120.0mm	Uncoated	$13.00
1101-196	N-BK7	30.0mm	4.3mm	2.5mm	120.0mm	350-650nm AR Coating	$19.50
1101-197	N-BK7	30.0mm	4.3mm	2.5mm	120.0mm	650-1050nm AR Coating	$19.50
1101-198	N-BK7	30.0mm	4.3mm	2.5mm	120.0mm	1050-1580nm AR Coating	$20.00
1101-093	N-BK7	30.0mm	3.1mm	1.6mm	150.0mm	Uncoated	$13.50
1101-199	N-BK7	30.0mm	3.1mm	1.6mm	150.0mm	350-650nm AR Coating	$20.00
1101-200	N-BK7	30.0mm	3.1mm	1.6mm	150.0mm	650-1050nm AR Coating	$20.00
1101-201	N-BK7	30.0mm	3.1mm	1.6mm	150.0mm	1050-1580nm AR Coating	$20.50
1101-094	N-BK7	30.0mm	2.8mm	1.7mm	200.0mm	Uncoated	$14.00
1101-202	N-BK7	30.0mm	2.8mm	1.7mm	200.0mm	350-650nm AR Coating	$20.00
1101-203	N-BK7	30.0mm	2.8mm	1.7mm	200.0mm	650-1050nm AR Coating	$20.00
1101-204	N-BK7	30.0mm	2.8mm	1.7mm	200.0mm	1050-1580nm AR Coating	$20.50
1101-095	N-BK7	30.0mm	2.6mm	1.7mm	250.0mm	Uncoated	$14.00
1101-205	N-BK7	30.0mm	2.6mm	1.7mm	250.0mm	350-650nm AR Coating	$20.50
1101-206	N-BK7	30.0mm	2.6mm	1.7mm	250.0mm	650-1050nm AR Coating	$20.50
1101-207	N-BK7	30.0mm	2.6mm	1.7mm	250.0mm	1050-1580nm AR Coating	$21.00
1101-096	N-BK7	30.0mm	2.5mm	1.8mm	300.0mm	Uncoated	$14.00
1101-208	N-BK7	30.0mm	2.5mm	1.8mm	300.0mm	350-650nm AR Coating	$20.50
1101-209	N-BK7	30.0mm	2.5mm	1.8mm	300.0mm	650-1050nm AR Coating	$20.50
1101-210	N-BK7	30.0mm	2.5mm	1.8mm	300.0mm	1050-1580nm AR Coating	$21.00
1101-097	N-BK7	30.0mm	2.3mm	1.8mm	500.0mm	Uncoated	$14.50
1101-211	N-BK7	30.0mm	2.3mm	1.8mm	500.0mm	350-650nm AR Coating	$21.00
1101-212	N-BK7	30.0mm	2.3mm	1.8mm	500.0mm	650-1050nm AR Coating	$21.00
1101-213	N-BK7	30.0mm	2.3mm	1.8mm	500.0mm	1050-1580nm AR Coating	$21.50
1101-098	N-BK7	50.8mm	16.3mm	3.0mm	60.0mm	Uncoated	$23.00
1101-214	N-BK7	50.8mm	16.3mm	3.0mm	60.0mm	350-650nm AR Coating	$33.50
1101-215	N-BK7	50.8mm	16.3mm	3.0mm	60.0mm	650-1050nm AR Coating	$33.50
1101-216	N-BK7	50.8mm	16.3mm	3.0mm	60.0mm	1050-1580nm AR Coating	$34.00
1101-099	N-BK7	50.8mm	12.5mm	3.0mm	75.0mm	Uncoated	$22.00
1101-217	N-BK7	50.8mm	12.5mm	3.0mm	75.0mm	350-650nm AR Coating	$32.50

Product List of λ/4-λ N-BK7 Plano-convex Lenses

Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1101-218	N-BK7	50.8mm	12.5mm	3.0mm	75.0mm	650-1050nm AR Coating	$32.50
1101-219	N-BK7	50.8mm	12.5mm	3.0mm	75.0mm	1050-1580nm AR Coating	$33.00
1101-100	N-BK7	50.8mm	9.7mm	3.0mm	100.0mm	Uncoated	$23.00
1101-220	N-BK7	50.8mm	9.7mm	3.0mm	100.0mm	350-650nm AR Coating	$33.50
1101-221	N-BK7	50.8mm	9.7mm	3.0mm	100.0mm	650-1050nm AR Coating	$33.50
1101-222	N-BK7	50.8mm	9.7mm	3.0mm	100.0mm	1050-1580nm AR Coating	$34.00
1101-101	N-BK7	50.8mm	8.2mm	3.0mm	125.0mm	Uncoated	$23.00
1101-223	N-BK7	50.8mm	8.2mm	3.0mm	125.0mm	350-650nm AR Coating	$33.50
1101-224	N-BK7	50.8mm	8.2mm	3.0mm	125.0mm	650-1050nm AR Coating	$33.50
1101-225	N-BK7	50.8mm	8.2mm	3.0mm	125.0mm	1050-1580nm AR Coating	$34.00
1101-102	N-BK7	50.8mm	7.3mm	3.0mm	150.0mm	Uncoated	$23.00
1101-226	N-BK7	50.8mm	7.3mm	3.0mm	150.0mm	350-650nm AR Coating	$33.50
1101-227	N-BK7	50.8mm	7.3mm	3.0mm	150.0mm	650-1050nm AR Coating	$33.50
1101-228	N-BK7	50.8mm	7.3mm	3.0mm	150.0mm	1050-1580nm AR Coating	$34.00
1101-103	N-BK7	50.8mm	6.7mm	3.0mm	175.0mm	Uncoated	$23.00
1101-229	N-BK7	50.8mm	6.7mm	3.0mm	175.0mm	350-650nm AR Coating	$33.50
1101-230	N-BK7	50.8mm	6.7mm	3.0mm	175.0mm	650-1050nm AR Coating	$33.50
1101-231	N-BK7	50.8mm	6.7mm	3.0mm	175.0mm	1050-1580nm AR Coating	$34.00
1101-104	N-BK7	50.8mm	6.2mm	3.0mm	200.0mm	Uncoated	$23.50
1101-232	N-BK7	50.8mm	6.2mm	3.0mm	200.0mm	350-650nm AR Coating	$34.00
1101-233	N-BK7	50.8mm	6.2mm	3.0mm	200.0mm	650-1050nm AR Coating	$34.00
1101-234	N-BK7	50.8mm	6.2mm	3.0mm	200.0mm	1050-1580nm AR Coating	$34.50
1101-105	N-BK7	50.8mm	5.5mm	3.0mm	250.0mm	Uncoated	$24.00
1101-235	N-BK7	50.8mm	5.5mm	3.0mm	250.0mm	350-650nm AR Coating	$34.50
1101-236	N-BK7	50.8mm	5.5mm	3.0mm	250.0mm	650-1050nm AR Coating	$34.50
1101-237	N-BK7	50.8mm	5.5mm	3.0mm	250.0mm	1050-1580nm AR Coating	$35.00
1101-106	N-BK7	50.8mm	5.1mm	3.0mm	300.0mm	Uncoated	$24.00
1101-238	N-BK7	50.8mm	5.1mm	3.0mm	300.0mm	350-650nm AR Coating	$34.50
1101-239	N-BK7	50.8mm	5.1mm	3.0mm	300.0mm	650-1050nm AR Coating	$34.50
1101-240	N-BK7	50.8mm	5.1mm	3.0mm	300.0mm	1050-1580nm AR Coating	$35.00
1101-107	N-BK7	50.8mm	4.6mm	3.0mm	400.0mm	Uncoated	$24.50
1101-241	N-BK7	50.8mm	4.6mm	3.0mm	400.0mm	350-650nm AR Coating	$35.00
1101-242	N-BK7	50.8mm	4.6mm	3.0mm	400.0mm	650-1050nm AR Coating	$35.00
1101-243	N-BK7	50.8mm	4.6mm	3.0mm	400.0mm	1050-1580nm AR Coating	$35.50
1101-108	N-BK7	50.8mm	4.3mm	3.0mm	500.0mm	Uncoated	$25.00
1101-244	N-BK7	50.8mm	4.3mm	3.0mm	500.0mm	350-650nm AR Coating	$35.50
1101-245	N-BK7	50.8mm	4.3mm	3.0mm	500.0mm	650-1050nm AR Coating	$35.50
1101-246	N-BK7	50.8mm	4.3mm	3.0mm	500.0mm	1050-1580nm AR Coating	$36.00
1101-109	N-BK7	50.8mm	3.8mm	3.0mm	750.0mm	Uncoated	$25.50
1101-247	N-BK7	50.8mm	3.8mm	3.0mm	750.0mm	350-650nm AR Coating	$36.00
1101-248	N-BK7	50.8mm	3.8mm	3.0mm	750.0mm	650-1050nm AR Coating	$36.00
1101-249	N-BK7	50.8mm	3.8mm	3.0mm	750.0mm	1050-1580nm AR Coating	$36.50
1101-110	N-BK7	50.8mm	3.6mm	3.0mm	1000.0mm	Uncoated	$26.00
1101-250	N-BK7	50.8mm	3.6mm	3.0mm	1000.0mm	350-650nm AR Coating	$36.50
1101-251	N-BK7	50.8mm	3.6mm	3.0mm	1000.0mm	650-1050nm AR Coating	$36.50
1101-252	N-BK7	50.8mm	3.6mm	3.0mm	1000.0mm	1050-1580nm AR Coating	$37.00
1101-111	N-BK7	75.0mm	24.2mm	3.0mm	85.0mm	Uncoated	$70.00
1101-253	N-BK7	75.0mm	24.2mm	3.0mm	85.0mm	350-650nm AR Coating	$96.00
1101-254	N-BK7	75.0mm	24.2mm	3.0mm	85.0mm	650-1050nm AR Coating	$96.00
1101-255	N-BK7	75.0mm	24.2mm	3.0mm	85.0mm	1050-1580nm AR Coating	$99.00
1101-112	N-BK7	75.0mm	19.2mm	3.0mm	100.0mm	Uncoated	Inquire
1101-256	N-BK7	75.0mm	19.2mm	3.0mm	100.0mm	350-650nm AR Coating	Inquire
1101-257	N-BK7	75.0mm	19.2mm	3.0mm	100.0mm	650-1050nm AR Coating	Inquire
1101-258	N-BK7	75.0mm	19.2mm	3.0mm	100.0mm	1050-1580nm AR Coating	Inquire
1101-113	N-BK7	75.0mm	12.7mm	3.0mm	150.0mm	Uncoated	Inquire
1101-259	N-BK7	75.0mm	12.7mm	3.0mm	150.0mm	350-650nm AR Coating	Inquire
1101-260	N-BK7	75.0mm	12.7mm	3.0mm	150.0mm	650-1050nm AR Coating	Inquire
1101-261	N-BK7	75.0mm	12.7mm	3.0mm	150.0mm	1050-1580nm AR Coating	Inquire
1101-114	N-BK7	75.0mm	10.1mm	3.0mm	200.0mm	Uncoated	Inquire
1101-262	N-BK7	75.0mm	10.1mm	3.0mm	200.0mm	350-650nm AR Coating	Inquire
1101-263	N-BK7	75.0mm	10.1mm	3.0mm	200.0mm	650-1050nm AR Coating	Inquire
1101-264	N-BK7	75.0mm	10.1mm	3.0mm	200.0mm	1050-1580nm AR Coating	Inquire

λ/10 UV Fused Silica Plano-convex Lenses





- Made of Corning UV Grade Fused Silica Glass (Corning HPFS), Wavelength range: 200-2200nm
- Standardized focal lengths and diameters convenient for OEM
- High precision: λ/10 Irregularities and 10/5 S/D surface qualities
- Ideal for UV-NIR wavelengths and durable under high temperature
- Coating options: uncoated, V-coating, or Broadband Anti-reflection (BBAR) coatings.
- Applications: detectors, imaging systems, lasers, fiber lasers, etc.

UV Fused Silica is the amorphous form of Silicon Dioxide. The material features superior transmission in the UV region and could be utilized for wavelengths ranging from Ultraviolet (UV) to Near-infrared (NIR) spectrum. Other than UV transmission, UV-grade fused silica glass also excels in terms of low thermal expansion, high optical homogeneities, chemical inertness, mechanical strength, and the absence of fluorescence under UV radiation. Compared with NBK7, the material is more reliable for high-temperature environments and higher transmission to the ultraviolet spectrum.

Hangzhou Shalom EO offers stocked and custom Plano Convex Lenses made of high-quality UV Fused Silica sourced from Corning, or JGS1 with excellent mechanical rigidness, and chemical inertia (The lenses in the stock list are made of Corning 7980-0F, 7980-1D). These lenses could be applied for wavelengths ranging from 200-2200nm, and are high-precision lenses with irregularity of λ/10, and surface qualities of 10/5 S/D. The UV-fused silica plano-convex lenses find prominent utilities in detectors, imaging instruments, lasers, fiber lasers, etc. The focal lengths of the stocked UV Fused Silica plano-convex lenses range from 20-1000mm, while other focal lengths could be customized. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch, to ensure tight tolerance and secure your interest. Besides, the standard options with irregularities of λ/4-λ are also available.

Specifications:

Lens Form	Plano-convex Lens	Material	Custom: Corning HPFS glass series, JGS1 Stock:Corning 7980-0F, 7980-1D
Surface Quality (Scratch/Dig)	10/5	Irregularity(@632.8nm)	λ/10
Centering Error	≤2 arc min	Clear Aperture	90%
Protective Chamfer	0.2mmx45°	Diameters(mm)	12.7mm, 25.4mm, or custom

Product List of λ/10 UV Fused Silica Plano-convex Lenses

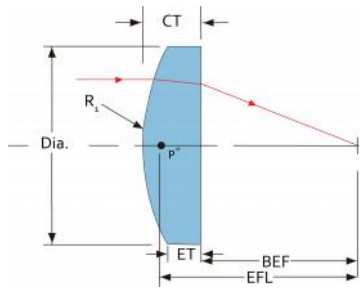
Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1102-001	C7980-0F	12.7	4.0	1.4	20mm	Uncoated	$29.0
1102-002	C7980-0F	12.7	4.0	1.4	20mm	400-700nm AR	$44.0
1102-003	C7980-0F	12.7	4.0	1.4	20mm	700-1100nm AR	$44.0
1102-004	C7980-0F	12.7	4.0	1.4	20mm	1100-1650nm AR	$44.0
1102-006	C7980-0F	12.7	4.0	1.4	20mm	532nm AR	$44.0
1102-005	C7980-0F	12.7	4.0	1.4	20mm	1064nm AR	$44.0
1102-007	C7980 0F	12.7	3.7	2.1	30mm	Uncoated	$29.0
1102-009	C7980 0F	12.7	3.7	2.1	30mm	700-1100nm AR	$44.0
1102-010	C7980 0F	12.7	3.7	2.1	30mm	1100-1650nm AR	$44.0
1102-012	C7980 0F	12.7	3.7	2.1	30mm	532nm AR	$44.0
1102-011	C7980 0F	12.7	3.7	2.1	30mm	1064nm AR	$44.0
1102-013	C7980-0F	12.7	2.5	1.4	40mm	Uncoated	$29.0
1102-014	C7980-0F	12.7	2.5	1.4	40mm	400-700nm AR	$44.0
1102-015	C7980-0F	12.7	2.5	1.4	40mm	700-1100nm AR	$44.0
1102-016	C7980-0F	12.7	2.5	1.4	40mm	1100-1650nm AR	$44.0
1102-018	C7980-0F	12.7	2.5	1.4	40mm	532nm AR	$44.0
1102-017	C7980-0F	12.7	2.5	1.4	40mm	1064nm AR	$44.0
1102-019	C7980-0F	12.7	3.0	2.1	50mm	Uncoated	$29.0
1102-020	C7980-0F	12.7	3.0	2.1	50mm	400-700nm AR	$44.0
1102-021	C7980-0F	12.7	3.0	2.1	50mm	700-1100nm AR	$44.0
1102-022	C7980-0F	12.7	3.0	2.1	50mm	1100-1650nm AR	$44.0
1102-023	C7980-0F	12.7	3.0	2.1	50mm	1064nm AR	$44.0
1102-024	C7980-0F	12.7	3.0	2.1	50mm	532nm AR	$44.0
1102-031	C7980-0F	25.4	6.0	2.2	50mm	Uncoated	$44.0
1102-032	C7980-0F	25.4	6.0	2.2	50mm	400-700nm AR	$67.0
1102-033	C7980-0F	25.4	6.0	2.2	50mm	700-1100nm AR	$67.0
1102-034	C7980-0F	25.4	6.0	2.2	50mm	1100-1650nm AR	$67.0
1102-137	C7980-0F	25.4	6.0	2.2	50mm	343nm AR	$67.0
1102-138	C7980-0F	25.4	6.6	2.2	50mm	355nm AR	$67.0
1102-036	C7980-0F	25.4	6.0	2.2	50mm	532nm AR	$67.0
1102-139	C7980-0F	25.4	6.0	2.2	50mm	1030nm AR	$67.0
1102-035	C7980-0F	25.4	6.0	2.2	50mm	1064nm AR	$67.0
1102-037	C7980-0F	25.4	4.5	2.1	75mm	Uncoated	$29.0
1102-038	C7980-0F	25.4	4.5	2.1	75mm	400-700nm AR	$44.0
1102-039	C7980-0F	25.4	4.5	2.1	75mm	700-1100nm AR	$44.0
1102-040	C7980-0F	25.4	4.5	2.1	75mm	1100-1650nm AR	$44.0

Product List of λ/10 UV Fused Silica Plano-convex Lenses

Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1102-041	C7980-0F	25.4	4.5	2.1	75mm	1064nm AR	$44.0
1102-042	C7980-0F	25.4	4.5	2.1	75mm	532nm AR	$44.0
1102-025	C7980-0F	12.7	3.0	2.6	100mm	Uncoated	$44.0
1102-026	C7980-0F	12.7	3.0	2.6	100mm	400-700nm AR	$67.0
1102-027	C7980-0F	12.7	3.0	2.6	100mm	700-1100nm AR	$67.0
1102-028	C7980-0F	12.7	3.0	2.6	100mm	1100-1650nm AR	$67.0
1102-029	C7980-0F	12.7	3.0	2.6	100mm	1064nm AR	$67.0
1102-030	C7980-0F	12.7	3.0	2.6	100mm	532nm AR	$67.0
1102-073	C7980-1D	25.4	4.0	2.2	100mm	Uncoated	$67.0
1102-074	C7980-1D	25.4	4.0	2.2	100mm	400-700nm AR	$67.0
1102-075	C7980-1D	25.4	4.0	2.2	100mm	700-1100nm AR	$67.0
1102-076	C7980-1D	25.4	4.0	2.2	100mm	1100-1650nm AR	$67.0
1102-140	C7980-0F	25.4	4.0	2.2	100mm	343nm AR	$67.0
1102-141	C7980-0F	25.4	4.0	2.2	100mm	355nm AR	$67.0
1102-078	C7980-1D	25.4	4.0	2.2	100mm	532nm AR	$44.0
1102-142	C7980-0F	25.4	4.0	2.2	100mm	1030nm AR	$67.0
1102-077	C7980-1D	25.4	4.0	2.2	100mm	1064nm AR	$67.0
1102-043	C7980-0F	25.4	4.0	2.6	125mm	Uncoated	$44.0
1102-044	C7980-0F	25.4	4.0	2.6	125mm	400-700nm AR	$67.0
1102-045	C7980-0F	25.4	4.0	2.6	125mm	700-1100nm AR	$67.0
1102-046	C7980-0F	25.4	4.0	2.6	125mm	1100-1650nm AR	$67.0
1102-047	C7980-0F	25.4	4.0	2.6	125mm	1064nm AR	$67.0
1102-048	C7980-0F	25.4	4.0	2.6	125mm	532nm AR	$67.0
1102-049	C7980-0F	25.4	4.0	2.8	150mm	Uncoated	$44.0
1102-050	C7980-0F	25.4	4.0	2.8	150mm	400-700nm AR	$67.0
1102-051	C7980-0F	25.4	4.0	2.8	150mm	700-1100nm AR	$67.0
1102-052	C7980-0F	25.4	4.0	2.8	150mm	1100-1650nm AR	$67.0
1102-143	C7980-0F	25.4	4.0	2.8	150mm	343nm AR	$67.0
1102-144	C7980-0F	25.4	4.0	2.8	150mm	355nm AR	$67.0
1102-054	C7980-0F	25.4	4.0	2.8	150mm	532nm AR	$67.0
1102-145	C7980-0F	25.4	4.0	2.8	150mm	1030nm AR	$67.0
1102-053	C7980-0F	25.4	4.0	2.8	150mm	1064nm AR	$67.0
1102-079	C7980-1D	25.4	4.0	3.1	200mm	Uncoated	$67.0
1102-080	C7980-1D	25.4	4.0	3.1	200mm	400-700nm AR	$67.0
1102-081	C7980-1D	25.4	4.0	3.1	200mm	700-1100nm AR	$67.0
1102-082	C7980-1D	25.4	4.0	3.1	200mm	1100-1650nm AR	$67.0
1102-146	C7980-0F	25.4	4.0	3.1	200mm	343nm AR	$67.0
1102-147	C7980-0F	25.4	4.0	3.1	200mm	355nm AR	$67.0
1102-084	C7980-1D	25.4	4.0	3.1	200mm	532nm AR	$44.0
1102-148	C7980-0F	25.4	4.0	3.1	200mm	1030nm AR	$67.0
1102-083	C7980-1D	25.4	4.0	3.1	200mm	1064nm AR	$67.0
1102-086	C7980-1D	25.4	4.0	3.4	300mm	400-700nm AR	$67.0
1102-087	C7980-1D	25.4	4.0	3.4	300mm	700-1100nm AR	$67.0
1102-088	C7980-1D	25.4	4.0	3.4	300mm	1100-1650nm AR	$67.0
1102-149	C7980-0F	25.4	4.0	3.4	300mm	343nm AR	$67.0
1102-150	C7980-0F	25.4	4	3.4	300mm	355nm AR	$67.0
1102-090	C7980-1D	25.4	4.0	3.4	300mm	532nm AR	$67.0
1102-151	C7980-0F	25.4	4.0	3.4	300mm	1030nm AR	$67.0
1102-089	C7980-1D	25.4	4.0	3.4	300mm	1064nm AR	$67.0
1102-091	C7980-1D	25.4	4.0	3.6	400mm	Uncoated	$44.0
1102-092	C7980-1D	25.4	4.0	3.6	400mm	400-700nm AR	$67.0
1102-093	C7980-1D	25.4	4.0	3.6	400mm	700-1100nm AR	$67.0
1102-094	C7980-1D	25.4	4.0	3.6	400mm	1100-1650nm AR	$67.0
1102-152	C7980-0F	25.4	4.0	3.6	400mm	343nm AR	$67.0
1102-153	C7980-0F	25.4	4.0	3.6	400nm	355nm AR	$67.0
1102-096	C7980-1D	25.4	4.0	3.6	400mm	532nm AR	$67.0
1102-154	C7980-0F	25.4	4.0	3.6	400mm	1030nm AR	$67.0
1102-095	C7980-1D	25.4	4.0	3.6	400mm	1064nm AR	$67.0
1102-055	C7980-0F	25.4	4.0	3.6	500mm	Uncoated	$44.0
1102-056	C7980-0F	25.4	4.0	3.6	500mm	400-700nm AR	$67.0
1102-057	C7980-0F	25.4	4.0	3.6	500mm	700-1100nm AR	$67.0
1102-058	C7980-0F	25.4	4.0	3.6	500mm	1100-1650nm AR	$67.0
1102-155	C7980-0F	25.4	4.0	3.6	500mm	343nm AR	$67.0
1102-156	C7980-0F	25.4	4.0	3.6	500mm	355nm AR	$67.0
1102-060	C7980-0F	25.4	4.0	3.6	500mm	532nm AR	$67.0
1102-157	C7980-0F	25.4	4.0	3.6	500mm	1030nm AR	$67.0
1102-059	C7980-0F	25.4	4.0	3.6	500mm	1064nm AR	$67.0
1102-097	C7980-1D	25.4	4.0	3.7	600mm	Uncoated	$44.0
1102-098	C7980-1D	25.4	4.0	3.7	600mm	400-700nm AR	$67.0
1102-099	C7980-1D	25.4	4.0	3.7	600mm	700-1100nm AR	$67.0
1102-100	C7980-1D	25.4	4.0	3.7	600mm	1100-1650nm AR	$67.0
1102-158	C7980-0F	25.4	4.0	3.7	600mm	343nm AR	$67.0
1102-159	C7980-0F	25.4	4.0	3.7	600mm	355nm AR	$67.0
1102-102	C7980-1D	25.4	4.0	3.7	600mm	532nm AR	$67.0
1102-160	C7980-0F	25.4	4.0	3.7	600mm	1030nm AR	$67.0
1102-101	C7980-1D	25.4	4.0	3.7	600mm	1064nm AR	$67.0
1102-061	C7980-0F	25.4	4.0	3.8	750mm	Uncoated	$44.0
1102-062	C7980-0F	25.4	4.0	3.8	750mm	400-700nm AR	$67.0
1102-063	C7980-0F	25.4	4.0	3.8	750mm	700-1100nm AR	$67.0
1102-064	C7980-0F	25.4	4.0	3.8	750mm	1100-1650nm AR	$67.0
1102-065	C7980-0F	25.4	4.0	3.8	750mm	1064nm AR	$67.0
1102-066	C7980-0F	25.4	4.0	3.8	750mm	532nm AR	$67.0
1102-161	C7980-0F	25.4	/	/	800mm	3434nm AR	$67.0
1102-162	C7980-0F	25.4	/	/	800mm	355nm AR	$67.0
1102-163	C7980-0F	25.4	/	/	800mm	532nm AR	$67.0
1102-164	C7980-0F	25.4	/	/	800mm	1030nm AR	$67.0
1102-165	C7980-0F	25.4	/	/	800mm	1064nm AR	$67.0
1102-067	C7980-0F	25.4	4.0	3.8	1000mm	Uncoated	$67.0
1102-068	C7980-0F	25.4	4.0	3.8	1000mm	400-700nm AR	$67.0
1102-069	C7980-0F	25.4	4.0	3.8	1000mm	700-1100nm AR	$67.0
1102-070	C7980-0F	25.4	4.0	3.8	1000mm	1100-1650nm AR	$67.0
1102-166	C7980-0F	25.4	4.0	3.8	1000mm	343nm AR	$67.0
1102-167	C7980-0F	25.4	4.0	3.8	1000mm	355nm AR	$67.0
1102-072	C7980-0F	25.4	4.0	3.8	1000mm	532nm AR	$44.0
1102-168	C7980-0F	25.4	4.0	3.8	1000mm	1030nm AR	$67.0
1102-071	C7980-0F	25.4	4.0	3.8	1000mm	1064nm AR	$67.0

λ/4-λ UV Fused Silica Plano-convex Lenses





- Made of UV Fused Silica (JGS1)
- Diameter 5-75mm, EFL 10-500mm, or custom.
- This page highlights the standard λ/4-λ, 40/20 S/D UVFS pcx lenses, while high precision UVFS pcx lenses with λ/10 Irregularities and 10/5 S/D surface qualities are also available
- Ideal for UV-NIR wavelengths and durable under high temperature
- Coating options: uncoated, or custom V-coating, or Broadband Anti-reflection(BBAR) coatings.
- Applications: detectors, imaging systems, lasers, fiber lasers, etc.

UV Fused Silica, identical to JGS1, is the amorphous form of SiO2. The material features superior transmission in the UV region and could be utilized for wavelengths ranging from Ultraviolet (UV) to Near-infrared (NIR) spectrum. Other than UV transmission, UV-grade fused silica glass also excels in terms of low thermal expansion, high optical homogeneities, chemical inertness, mechanical strength, and the absence of fluorescence under UV radiation. Compared with N-BK7, the material is more reliable for high-temperature environments and higher transmission to the ultraviolet spectrum.

Hangzhou Shalom EO offers stocked and custom Plano Convex Lenses made of UV Fused Silica (JGS1) with excellent UV transmission, mechanical strength, and chemical resistance. This section highlights the standard grade off-the-shelf λ/4-λ Irregularities, 40/20 S/D UV Fused Silica Plano-convex lenses, while high precision UVFS pcx lenses with λ/10 Irregularities and 10/5 S/D surface qualities made from Corning 7980 glass are also available.

Our UV-fused silica plano-convex lenses are optimized for incorporations into a broad range of optical systems like detectors, imaging instruments, lasers, fiber lasers, etc. Focal lengths of these λ/4-λ UV Fused Silica plano-convex lenses range from 10-1000mm and are accessible for high precision UVFS pcx), while other focal lengths could be customized. The standard diameters are 6-75.0mm, tailored diameters are also possible. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch, to ensure tight tolerance and secure your interest. The UVFS pcx lenses on this page are typically offered in uncoated versions, whilst custom v-coatings and BBAR coatings could also be arranged upon request.

Specifications:

Lens Form	Plano-convex Lens	Material	UV Fused Silica (JGS1)
Working Wavelength Range	200-2200nm	Coating	Uncoated, V-coating, BBAR coating
Surface Quality (S/D)	40/20	Irregularity@632.8nm	λ/4-λ
Clear Aperture	>90%	Centering Error	≤3 arc min
Protective Chamfer	0.2mmx45°	Diameters	6-75mm,or custom

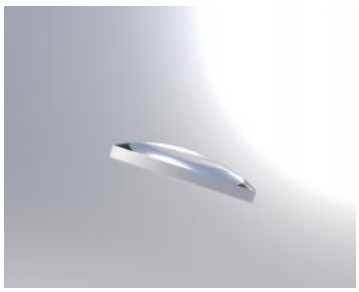
Product List of λ/4-λ UV Fused Silica Plano-convex Lenses

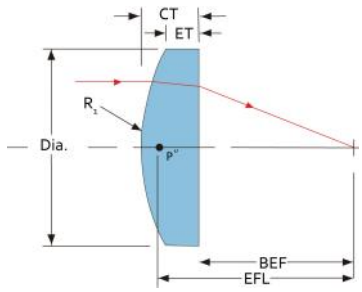
Material	Diameter	CT	ET	Focal length	Coating	Unit Price
UV Fused Silica	6.0mm	2.6mm	1.5mm	10mm	Uncoated	$20.50
UV Fused Silica	6.0mm	2.2mm	1.5mm	15mm	Uncoated	$20.50
UV Fused Silica	6.0mm	2.0mm	1.5mm	20mm	Uncoated	$17.50
UV Fused Silica	6.0mm	1.8mm	1.5mm	30mm	Uncoated	$17.50
UV Fused Silica	12.7mm	3.3mm	1.8mm	30mm	Uncoated	$17.50

Product List of λ/4-λ UV Fused Silica Plano-convex Lenses

Material	Diameter	CT	ET	Focal length	Coating	Unit Price
UV Fused Silica	12.7mm	2.9mm	1.8mm	40mm	Uncoated	$17.50
UV Fused Silica	12.7mm	2.7mm	1.8mm	50mm	Uncoated	$17.50
UV Fused Silica	12.7mm	2.4mm	1.8mm	75mm	Uncoated	$17.50
UV Fused Silica	12.7mm	2.2mm	1.8mm	100mm	Uncoated	$17.50
UV Fused Silica	25.4mm	8.2mm	2.0mm	35mm	Uncoated	$42.00
UV Fused Silica	25.4mm	7.1mm	2.0mm	40mm	Uncoated	$42.00
UV Fused Silica	25.4mm	4.4mm	2.0mm	75mm	Uncoated	$42.00
UV Fused Silica	25.4mm	3.8mm	2.0mm	100mm	Uncoated	$42.00
UV Fused Silica	25.4mm	3.4mm	2.0mm	125mm	Uncoated	$42.00
UV Fused Silica	25.4mm	3.2mm	2.0mm	150mm	Uncoated	$42.00
UV Fused Silica	25.4mm	3.0mm	2.0mm	175mm	Uncoated	$42.00
UV Fused Silica	25.4mm	2.7mm	2.0mm	250mm	Uncoated	$42.00
UV Fused Silica	25.4mm	2.6mm	2.0mm	300mm	Uncoated	$45.00
UV Fused Silica	25.4mm	2.2mm	2.0mm	750mm	Uncoated	$45.00
UV Fused Silica	25.4mm	2.2mm	2.0mm	1000mm	Uncoated	$45.00
UV Fused Silica	50.8mm	19.8mm	3.0mm	60mm	Uncoated	$125.00
UV Fused Silica	50.8mm	14.2mm	3.0mm	75mm	Uncoated	$87.00
UV Fused Silica	50.8mm	10.7mm	3.0mm	100mm	Uncoated	$87.00
UV Fused Silica	50.8mm	7.8mm	3.0mm	150mm	Uncoated	$87.00
UV Fused Silica	50.8mm	6.6mm	3.0mm	200mm	Uncoated	$87.00
UV Fused Silica	50.8mm	5.8mm	3.0mm	250mm	Uncoated	$87.00
UV Fused Silica	50.8mm	5.4mm	3.0mm	300mm	Uncoated	$90.00
UV Fused Silica	50.8mm	4.4mm	3.0mm	500mm	Uncoated	$90.00
UV Fused Silica	50.8mm	3.9mm	3.0mm	750mm	Uncoated	$90.00
UV Fused Silica	50.8mm	3.7mm	3.0mm	1000mm	Uncoated	$90.00
UV Fused Silica	75.0mm	26.9mm	3.0mm	90mm	Uncoated	Inquire
UV Fused Silica	75.0mm	14.1mm	3.0mm	150mm	Uncoated	Inquire
UV Fused Silica	75.0mm	11.0mm	3.0mm	200mm	Uncoated	Inquire
UV Fused Silica	75.0mm	6.1mm	3.0mm	500mm	Uncoated	Inquire

CaF2 Plano-Convex Lenses





- One spherical side and one planar side are optimized for light collimation and focus at absolute conjugate ratios > 5:1
- Substrates made from high-purity CaF2 crystals with exception ally wide transmission from UV to IR (180-8000nm)
- High laser damage threshold and thermal shock resistance suitable for excimer lasers
- Standard CaF2 plano-convex lenses are available in uncoated versions, while custom coatings like BBAR, high-performance V-coatings, and MgF2 coatings are also available
- Applications: Infrared Optics, Ultraviolet Optical Components, Laser Processing such as Excimer Lasers, etc.

Calcium Fluoride (CaF2) is an excellent optical material with its natural high transmission from UV to MWIR wavelengths (180-8000nm) with favorably low levels of fluorescence, therefore it is widely utilized in infrared, and ultraviolet optical systems. The prominent LIDT (Laser-Induced Damage Threshold) of CaF2 renders it a capable candidate for high-energy detectors and excimer lasers. Besides, Calcium Fluoride is also more mechanically durable and chemically stable than other fluoride counterparts, the hardness of CaF2 is twice the magnitude of that of BaF2, with the addition that CaF2 is not prone to deliquesce and can endure thermal shock.

This page highlights Shalom EO's Stocked and Custom CaF2 Plano Convex Lenses, whilst you can browse and shop Off-the-Shelf N-BK7 Plano Convex Lenses, Off-the-Shelf UVFS Plano Convex Lenses, and custom Plano-convex lenses made from a wide assortment of optical materials including sapphire, ruby, Flint Glass/BaF2/Ge/Si, etc. Shalom EO is a proficient and capable supplier and manufacturer of optical lens components. The calcium fluoride we use to fabricate optical lenses exhibits high purities to ensure minimized OH contents, which are harmful to IR transmission. Shalom EO also leverages a stringent inspection procedure to ensure that the actual parameters of the lenses comply with our published specifications.

Our CaF2 Plano-convex lenses (standard) have diameters ranging from 12.7mm to 25.4mm and focal lengths ranging from 20mm to 1000mm, encompassing short focal lengths, mid-focal lengths, and long focal lengths. These stock CaF2 plano-convex lenses are currently available in uncoated versions, but custom coatings including Broadband AR Coatings (BBAR) with superior broadband performance, V coatings with minimized reflection over a narrow waveband, and MgF2 with high price-competitiveness are all procurable through inquiries. The stocked CaF2 flat-convex lenses have a conventional surface smoothness of 80/50 S/D and >80% clear aperture. However, Shalom EO is also capable of manufacturing Calcium Fluoride plano-convex lens components with higher precision if you have stricter requirements for the final performance.

Specifications:

Lens Form	Plano-convex Lens	Material	CaF2
Diameters(mm)	12.7-25.4mm (Standard), or Custom	Working Wavelength Range	180-8000nm
Coating	Standard Uncoated, or Custom BBAR/V-coating/MgF2	Surface Quality (S/D)	80/50
Irregularity@632.8nm	λ/4-λ	Centering Error	<2 arc min
Clear Aperture	>80%	Protective Chamfer	0.2mmx45°

Product List of CaF2 Plano-Convex Lenses

Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1109-001	CaF2	12.7mm	4.3mm	1.5mm	20mm	Uncoated	$54.50
1109-002	CaF2	12.7mm	2.5mm	1.5mm	50mm	Uncoated	$54.50
1109-003	CaF2	12.7mm	2.1mm	1.5mm	80mm	Uncoated	$54.50
1109-004	CaF2	25.4mm	7.5mm	2.0mm	40mm	Uncoated	$72.50
1109-005	CaF2	25.4mm	6.1mm	2.0mm	50mm	Uncoated	$72.50
1109-006	CaF2	25.4mm	4.6mm	2.0mm	75mm	Uncoated	$72.50
1109-007	CaF2	25.4mm	3.9mm	2.0mm	100mm	Uncoated	$72.50
1109-008	CaF2	25.4mm	3.3mm	2.0mm	150mm	Uncoated	$72.50
1109-009	CaF2	25.4mm	2.9mm	2.0mm	200mm	Uncoated	$72.50
1109-010	CaF2	25.4mm	2.7mm	2.0mm	250mm	Uncoated	$72.50
1109-011	CaF2	25.4mm	2.4mm	2.0mm	500mm	Uncoated	$72.50
1109-012	CaF2	25.4mm	2.2mm	2.0mm	750mm	Uncoated	$72.50
1109-013	CaF2	25.4mm	2.2mm	2.0mm	1000mm	Uncoated	$72.50

Plano-concave Lenses

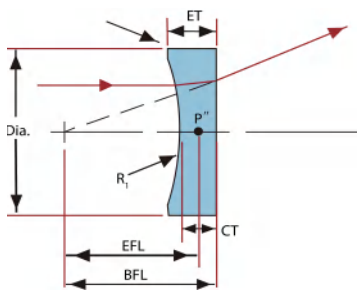


Plano-concave Lens is a bulk optical singlet with a flat side and a convex side, which contribute to a negative focal length and a negative spherical aberration. Plano concave lens diverges collimated light beams from a virtual focus and could be used to spread a collimated light beam, increase the focal length of an optical instrument, etc. Plano-concave lenses are often incorporated into Galilean beam expanders, also as components to balance out the spherical aberration, improving image qualities. When the absolute conjugate ratio is greater than 5:1(that is, the absolute value of objective distance: image distance), a Plano-concave lens is an excellent option to decrease spherical aberration, coma, and distortion.

Hangzhou Shalom EO offers stocked and custom Plano-concave Lenses, where you can browse and shop Off-the-Shelf N-BK7 Plano Concave Lenses, Off-the-Shelf UVFS Plano Concave Lenses, Off-the-Shelf CaF2 Plano Concave Lenses and custom Plano concave lenses made from a wide assortment of optical materials including sapphire, ruby, Flint Glass/BaF2/Ge/Si, etc. Shalom EO is a proficient and capable supplier and manufacturer of optical lens components. Shalom EO also leverages a stringent inspection procedure to ensure that the actual parameters of the lenses abide by our published specifications. Our inspection procedure includes an in-process checking stage of the optical properties of lenses and a final test of coatings, dimension precisions, and the visual observation of scratch/dig, apertures, inclusions, etc. We provide stocked and custom N-BK7 Plano-concave Lenses with a diameter range of 0.5-300mm, that ensure simple incorporation into various instruments like laser scanners, remote sensing, and imaging instruments, fiber lasers, interferometers, etc. The focal lengths of the stocked N-BK7 Plano-concave lenses differ from -25mm to -100mm, while other focal lengths could be customized. These N-BK7 lenses feature λ/4-λ irregularities and 40/20 scratch/dig. Plano Concave Lenses made from Corning High Purity UV Fused Silica Glass (Corning HPFS Glass), or JGS1 with excellent mechanical, and chemical rigidness are available in high-precision versions with irregularities of λ/10, and surface qualities of 10/5 S/D and normal versions with irregularities of λ/4-λ, and surface qualities of 40/20 S/D. Our CaF2 Plano concave lenses (standard) have diameters of 12.7mm to 25.4mm and focal lengths ranging from -18mm to -500mm. These stock CaF2 plano-convex lenses are currently available in uncoated versions, but custom coatings including Broadband AR Coatings (BBAR) with superior broadband performance, V coatings with minimized reflection over a narrow waveband, and MgF2 with high price-competitiveness are all procurable through inquiries.

λ/4-λ N-BK7 Plano-concave Lenses





- λ/4-λ N-BK7 Plano-concave Lenses
- Transmission wavelength range: 350-2200 nm
- Diameter range: 0.5mm to 300mm
- Standardized focal lengths and diameters are convenient for OEM
- Ideal for various applications in the visible to NIR region
- Coating options: uncoated, V-coating, or broadband anti-reflection (BBAR) coating
- Applications: laser scanners, remote sensing, imaging instruments, fiber lasers, and interferometers

N-BK7 glass is a RoHS-compliant borosilicate material prevalent for uses in the visible and NIR spectrum (in particular when it comes to manufacturing precision visible components). N-BK7 features high optical homogeneities, great resistance to scratches and abrasions, low cost, and low inclusion content, it is an ideal substitute for UV Fused Silica when high UV transmission is not required, and a preferred alternative for CaF2 at the 1.65-2.3 micro-operating wavelength region with the concern of lower manufacturing costs.

Hangzhou Shalom EO offers Stocked and Custom N-BK7 Plano-concave Lenses with a diameter range of 0.5-300mm, that allow for flexible incorporation into laser scanners, remote sensing, and imaging instruments, fiber lasers, interferometers, etc. The focal lengths of the stocked N-BK7 Plano-concave lenses differ from -25mm to -100mm, while other focal lengths could be customized. These lenses feature lambda/4 irregularities and 40/20 scratch/dig. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch, to ensure tight tolerance and secure your interest.

Specifications:

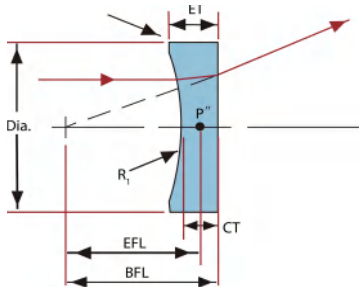
Lens Form	Plano-concaveLens	Material	N-BK7
Working Wavelength Range	350-2200nm	Coating	Uncoated, V-coating, BBAR coating
Surface Quality (S/D)	40/20	Irregularity@632.8nm	λ/4-λ
Centering Error	≤2 arc min	Clear Aperture	90%
Protective Chamfer	0.2mmx45°	Diameters	0.5-300mm

Product List of λ/4-λ N-BK7 Plano-concave Lenses

Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1103-001	N-BK7	12.7mm	1.8mm	3.5mm	-25mm	Uncoated	$12.00
1103-002	N-BK7	12.7mm	1.8mm	3.5mm	-25mm	400-700nm AR Coating	$20.00
1103-003	N-BK7	12.7mm	1.8mm	3.5mm	-25mm	700-1100nm AR Coating	$20.00
1103-004	N-BK7	12.7mm	1.8mm	3.5mm	-25mm	1100-1650nm AR Coating	$20.00
1103-005	N-BK7	12.7mm	2.1mm	3.5mm	-30mm	Uncoated	$12.00
1103-006	N-BK7	12.7mm	2.1mm	3.5mm	-30mm	400-700nm AR Coating	$20.00
1103-007	N-BK7	12.7mm	2.1mm	3.5mm	-30mm	700-1100nm AR Coating	$20.00
1103-008	N-BK7	12.7mm	2.1mm	3.5mm	-30mm	1100-1650nm AR Coating	$20.00
1103-009	N-BK7	12.7mm	2.7mm	3.5mm	-50mm	Uncoated	$12.00
1103-010	N-BK7	12.7mm	2.7mm	3.5mm	-50mm	400-700nm AR Coating	$20.00
1103-011	N-BK7	12.7mm	2.7mm	3.5mm	-50mm	700-1100nm AR Coating	$20.00
1103-012	N-BK7	12.7mm	2.7mm	3.5mm	-50mm	1100-1650nm AR Coating	$20.00
1103-013	N-BK7	25.4mm	2.7mm	6mm	-50mm	Uncoated	$14.00
1103-014	N-BK7	25.4mm	2.7mm	6mm	-50mm	400-700nm AR Coating	$20.00
1103-015	N-BK7	25.4mm	2.7mm	6mm	-50mm	700-1100nm AR Coating	$20.00
1103-016	N-BK7	25.4mm	2.7mm	6mm	-50mm	1100-1650nm AR Coating	$20.00
1103-017	N-BK7	25.4mm	2.7mm	5mm	-70mm	Uncoated	$14.00
1103-018	N-BK7	25.4mm	2.7mm	5mm	-70mm	400-700nm AR Coating	$20.00
1103-019	N-BK7	25.4mm	2.7mm	5mm	-70mm	700-1100nm AR Coating	$20.00
1103-020	N-BK7	25.4mm	2.7mm	5mm	-70mm	1100-1650nm AR Coating	$20.00
1103-025	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	Uncoated	$12.00
1103-026	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	350-650nm AR Coating	$18.00
1103-027	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	650-1050nm AR Coating	$18.00
1103-028	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	1050-1580nm AR Coating	$19.00
1103-021	N-BK7	25.4mm	3mm	4.6mm	-100mm	Uncoated	$14.00
1103-022	N-BK7	25.4mm	3mm	4.6mm	-100mm	400-700nm AR Coating	$20.00
1103-023	N-BK7	25.4mm	3mm	4.6mm	-100mm	700-1100nm AR Coating	$20.00
1103-024	N-BK7	25.4mm	3mm	4.6mm	-100mm	1100-1650nm AR Coating	$20.00

λ/10 UV Fused Silica Plano-concave Lenses





- Focal Lengths from -25mm to -300mm
- High precision: λ/10 Irregularities and 10/5 S/D surface qualities
- Ideal for various applications in the UV to NIR region
- Standardized focal lengths and diameters (12.7mm or 25.4mm) convenient for OEM
- Coating options: uncoated, V-coating, or broadband anti-reflection (BBAR) coating
- Applications: laser scanners, remote sensing, imaging instruments, fiber lasers, and interferometers

UV Fused Silica is the amorphous form of Silicon Dioxide. The material features superior transmission in the UV region and could be utilized for wavelengths ranging from Ultraviolet (UV) to Near-infrared (NIR) spectrum. Other than UV transmission, UV-grade fused silica glass also excels in terms of low thermal expansion, great chemical inertia, high optical homogeneities, and the absence of fluorescence under UV radiation. Compared with NBK7, the material is more reliable for high-temperature environments and has better transparency to ultraviolet lights. Our inspection procedure includes an in-process checking stage of the optical properties of lenses and a final test of coatings, dimension precisions, and the visual observation of scratch/dig, apertures, inclusions, etc.

Hangzhou Shalom EO offers stocked and custom Plano Concave Lenses made from Corning High Purity UV Fused Silica Glass (Corning HPFS Glass), or JGS1 with excellent mechanical, and chemical resilience (The lenses in the stock list are made from Corning 7980-0F, 7980-1D). These lenses could be applied for wavelengths ranging from 200-2200 nm, and are high-precision lenses with irregularities of λ/10, and surface qualities of 10/5 S/D. The UV-fused silica Plano concave lenses are optimized for various usages in laser scanners, remote sensing, imaging instruments, fiber lasers, interferometers, etc. The focal lengths of the stocked UV Fused Silica plano-convex lenses differ from -25mm to -300mm, while other focal lengths could be customized. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch, to ensure tight tolerance and secure your interest. If you are looking for lower costs, Shalom also provides λ/4-λ irregularities and 40/20 S/D UVFS PCV Lenses.

Specifications:

Lens Form	Plano-convex Lens	Material	Custom: Corning HPFS glass series, JGS1 Stock:Corning 7980-0F, 7980-1D
Surface Quality (Scratch/Dig)	10/5	Irregularity(@632.8nm)	λ/10
Centering Error	≤2 arc min	Clear Aperture	90%
Protective Chamfer	0.2mmx45°	Diameters(mm)	12.7mm, 25.4mm, or custom

Product List of λ/10 UV Fused Silica Plano-concave Lenses

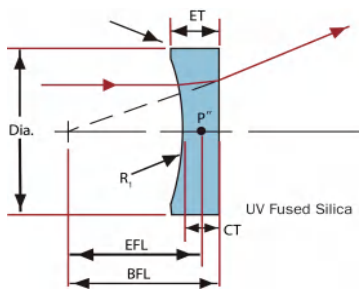
Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1104-001	C7980-0F	12.7mm	1.6mm	3.5mm	-25mm	Uncoated	$29.00
1104-002	C7980-0F	12.7mm	1.6mm	3.5mm	-25mm	400-700nm AR	$44.00
1104-003	C7980-0F	12.7mm	1.6mm	3.5mm	-25mm	700-1100nm AR	$44.00
1104-004	C7980-0F	12.7mm	1.6mm	3.5mm	-25mm	1100-1650nm AR	$44.00
1104-005	C7980-0F	12.7mm	1.6mm	3.5mm	-25mm	1064nm AR	$44.00
1104-006	C7980-0F	12.7mm	1.6mm	3.5mm	-25mm	532nm AR	$44.00
1104-007	C7980-0F	12.7mm	1.9mm	3.5mm	-30mm	Uncoated	$29.00
1104-008	C7980-0F	12.7mm	1.9mm	3.5mm	-30mm	400-700nm AR	$44.00

Product List of λ/10 UV Fused Silica Plano-concave Lenses

Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1104-009	C7980-0F	12.7mm	1.9mm	3.5mm	-30mm	700-1100nm AR	$44.00
1104-010	C7980-0F	12.7mm	1.9mm	3.5mm	-30mm	1100-1650nm AR	$44.00
1104-011	C7980-0F	12.7mm	1.9mm	3.5mm	-30mm	1064nm AR	$44.00
1104-012	C7980-0F	12.7mm	1.9mm	3.5mm	-30mm	532nm AR	$44.00
1104-013	C7980-0F	12.7mm	2.6mm	3.5mm	-50mm	Uncoated	$29.00
1104-014	C7980-0F	12.7mm	2.6mm	3.5mm	-50mm	400-700nm AR	$44.00
1104-015	C7980-0F	12.7mm	2.6mm	3.5mm	-50mm	700-1100nm AR	$44.00
1104-016	C7980-0F	12.7mm	2.6mm	3.5mm	-50mm	1100-1650nm AR	$44.00
1104-017	C7980-0F	12.7mm	2.6mm	3.5mm	-50mm	1064nm AR	$44.00
1104-018	C7980-0F	12.7mm	2.6mm	3.5mm	-50mm	532nm AR	$44.00
1104-019	C7980-0F	25.4mm	2.2mm	6mm	-50mm	Uncoated	$44.00
1104-020	C7980-0F	25.4mm	2.2mm	6mm	-50mm	400-700nm AR	$67.00
1104-021	C7980-0F	25.4mm	2.2mm	6mm	-50mm	700-1100nm AR	$67.00
1104-022	C7980-0F	25.4mm	2.2mm	6mm	-50mm	1100-1650nm AR	$67.00
1104-023	C7980-0F	25.4mm	2.2mm	6mm	-50mm	1064nm AR	$67.00
1104-024	C7980-0F	25.4mm	2.2mm	6mm	-50mm	532nm AR	$67.00
1104-025	C7980-0F	25.4mm	2.4mm	5mm	-70mm	Uncoated	$44.00
1104-026	C7980-0F	25.4mm	2.4mm	5mm	-70mm	400-700nm AR	$67.00
1104-027	C7980-0F	25.4mm	2.4mm	5mm	-70mm	700-1100nm AR	$67.00
1104-028	C7980-0F	25.4mm	2.4mm	5mm	-70mm	1100-1650nm AR	$67.00
1104-029	C7980-0F	25.4mm	2.4mm	5mm	-70mm	1064nm AR	$67.00
1104-030	C7980-0F	25.4mm	2.4mm	5mm	-70mm	532nm AR	$67.00
1104-031	C7980-0F	25.4mm	2.8mm	4.6mm	-100mm	Uncoated	$44.00
1104-032	C7980-0F	25.4mm	2.8mm	4.6mm	-100mm	400-700nm AR	$67.00
1104-033	C7980-0F	25.4mm	2.8mm	4.6mm	-100mm	700-1100nm AR	$67.00
1104-034	C7980-0F	25.4mm	2.8mm	4.6mm	-100mm	1100-1650nm AR	$67.00
1104-035	C7980-0F	25.4mm	2.8mm	4.6mm	-100mm	1064nm AR	$67.00
1104-036	C7980-0F	25.4mm	2.8mm	4.6mm	-100mm	532nm AR	$67.00
1104-037	C7980-1D	25.4mm	3.5mm	4.7mm	-150mm	Uncoated	$44.00
1104-038	C7980-1D	25.4mm	3.5mm	4.7mm	-150mm	400-700nm AR	$67.00
1104-039	C7980-1D	25.4mm	3.5mm	4.7mm	-150mm	700-1100nm AR	$67.00
1104-040	C7980-1D	25.4mm	3.5mm	4.7mm	-150mm	1100-1650nm AR	$67.00
1104-041	C7980-1D	25.4mm	3.5mm	4.7mm	-150mm	1064nm AR	$67.00
1104-042	C7980-1D	25.4mm	3.5mm	4.7mm	-150mm	532nm AR	$67.00
1104-043	C7980-1D	25.4mm	3.5mm	4.4mm	-200mm	Uncoated	$44.00
1104-044	C7980-1D	25.4mm	3.5mm	4.4mm	-200mm	400-700nm AR	$67.00
1104-045	C7980-1D	25.4mm	3.5mm	4.4mm	-200mm	700-1100nm AR	$67.00
1104-046	C7980-1D	25.4mm	3.5mm	4.4mm	-200mm	1100-1650nm AR	$67.00
1104-047	C7980-1D	25.4mm	3.5mm	4.4mm	-200mm	1064nm AR	$67.00
1104-048	C7980-1D	25.4mm	3.5mm	4.4mm	-200mm	532nm AR	$67.00
1104-049	C7980-1D	25.4mm	3.5mm	4.1mm	-300mm	Uncoated	$44.00
1104-050	C7980-1D	25.4mm	3.5mm	4.1mm	-300mm	400-700nm AR	$67.00
1104-051	C7980-1D	25.4mm	3.5mm	4.1mm	-300mm	700-1100nm AR	$67.00
1104-052	C7980-1D	25.4mm	3.5mm	4.1mm	-300mm	1100-1650nm AR	$67.00
1104-053	C7980-1D	25.4mm	3.5mm	4.1mm	-300mm	1064nm AR	$67.00
1104-054	C7980-1D	25.4mm	3.5mm	4.1mm	-300mm	532nm AR	$67.00

λ/4-λ UV Fused Silica Plano-concave Lenses





- Focal Lengths from -10mm to -150mm
- Economic cost: λ/4-λ Irregularities and 40/20 S/D surface quality
- Ideal for various applications in the UV to NIR region
- Standardized focal lengths and diameters (6.0-50.8mm) convenient for OEM
- Coating options: uncoated, V-coating, or broadband anti-reflection (BBAR) coating
- Applications: laser scanners, remote sensing, imaging instruments, fiber lasers, and interferometers

UV Fused Silica and its equivalent JGS1 are the amorphous forms of SiO2 (Silicon Dioxide). UV Fused Silica features superior transmission in the UV region and could be utilized for wavelengths ranging from Ultraviolet (UV) to Near-infrared (NIR) spectrum. Other than UV transmission, UV-grade fused silica glass also excels in terms of low thermal expansion, decent mechanical strength, high chemical inertness, and the absence of fluorescence under UV radiation. Compared with NBK7, the material is more endurable to higher temperatures.

If you are looking for a compromise of cost and performance then the products highlighted on this section from Shalom EO with λ/4-λ irregularities, 40/20 S/D JGS1 PCV Lenses are recommended. These lenses could be applied for wavelengths ranging from 200-2200 nm, our plano concave lenses are optimized for applications like laser scanners, remote sensing, imaging instruments, fiber lasers, interferometers, etc. The focal lengths of the stocked UV Fused Silica PCV lenses span from -10mm to -150mm, while other focal lengths could be customized, and the diameters range from 6.0mm to 50.8mm. Each piece of the lens will undergo strict inspection in Shalom EO's in-house labs before dispatch, to ensure tight tolerance and secure your interest. Hangzhou Shalom EO also offers high precision lambda/10 irregularities 10/5 Scratch/Dig stocked and custom Plano Concave Lenses made from Corning High Purity UV Fused Silicaλ Glass (Corning HPFS Glass) in another series.

Specifications:

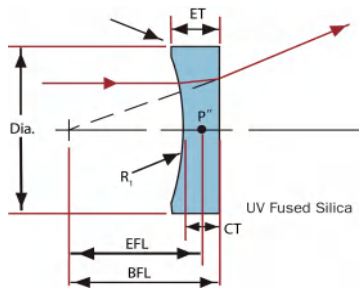
Lens Form	Plano-concave Lens	Material	JGS1 or Custom
Surface Quality (Scratch/Dig)	40/20	Irregularity(@632.8nm)	λ/4-λ
Centering Error	≤3 arc min	Clear Aperture	90%
Protective Chamfer	0.2mmx45°	Diameters(mm)	6.0-50.8mm, or custom

Product List of λ/4-λ UV Fused Silica Plano-concave Lenses

Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1104-055	UV Fused Silica	6.0mm	2.0mm	3.1mm	-10mm	Uncoated	$17.50
1104-056	UV Fused Silica	8.0mm	2.0mm	3.7mm	-12mm	Uncoated	$17.50
1104-057	UV Fused Silica	12.7mm	2.0mm	4.5mm	-20mm	Uncoated	$17.50
1104-058	UV Fused Silica	12.7mm	3.0mm	4.9mm	-25mm	Uncoated	$17.50
1104-059	UV Fused Silica	12.7mm	3.0mm	4.5mm	-30mm	Uncoated	$17.50
1104-060	UV Fused Silica	12.7mm	3.5mm	4.4mm	-50mm	Uncoated	$17.50
1104-061	UV Fused Silica	12.7mm	3.5mm	4.1mm	-75mm	Uncoated	$17.50
1104-062	UV Fused Silica	12.7mm	3.5mm	3.9mm	-100mm	Uncoated	$17.50
1104-063	UV Fused Silica	12.7mm	4.0mm	4.2mm	-200mm	Uncoated	$17.50
1104-064	UV Fused Silica	25.4mm	3.0mm	11.4mm	-30mm	Uncoated	$42.00
1104-065	UV Fused Silica	25.4mm	3.0mm	6.8mm	-50mm	Uncoated	$42.00
1104-066	UV Fused Silica	25.4mm	3.5mm	5.9mm	-75mm	Uncoated	$42.00
1104-067	UV Fused Silica	25.4mm	3.5mm	5.3mm	-100mm	Uncoated	$42.00
1104-068	UV Fused Silica	50.8mm	3.5mm	14.6mm	-75mm	Uncoated	$87.00
1104-069	UV Fused Silica	50.8mm	4.0mm	11.6mm	-100mm	Uncoated	$87.00
1104-070	UV Fused Silica	50.8mm	4.0mm	8.8mm	-150mm	Uncoated	$87.00

CaF2 Plano-Concave Lenses





- Flat-concave structure optimized for light collimation and diverging at absolute conjugate ratios > 5:1
- Substrates made from high-purity CaF2 crystals with exception ally wide transmission from UV to IR (180-8000 nm)
- High laser damage threshold and thermal shock resistance suitable for excimer lasers
- Standard CaF2 Plano concave lenses are available in uncoated versions, while custom coatings like BBAR, high-performance V-coatings, and MgF2 coatings
- Applications: Infrared Lenses, Ultraviolet Optical Components, Laser Processing such as Excimer Lasers, etc.

Calcium Fluoride (CaF2) is an excellent optical material with its natural high transmission from UV to MWIR wavelengths (180-8000nm) with favorably low levels of fluorescence, therefore it is widely utilized in infrared, and ultraviolet optical systems. CaF2 exhibits prominent LIDT (Laser-Induced Damage Threshold), small refractive index, and low birefringence, the combination of which empowers CaF2 Plano concave lenses with the competence for excimer lasers and infrared lens groups. Besides, Calcium Fluoride is also more mechanically durable and chemically stable than other fluoride counterparts, the hardness of CaF2 is twice the magnitude of that of BaF2, with the addition that CaF2 is not prone to deliquesce and can endure thermal shock.

This page highlights Shalom EO's Stocked and Custom CaF2 Plano Concave Lenses, whilst you can browse and shop Off-the-Shelf N-BK7 Plano Concave Lenses, Off-the-Shelf UVFS Plano Concave Lenses and custom Plano concave lenses made from a wide assortment of optical materials including sapphire, ruby, Flint Glass/BaF2/Ge/Si, etc. Shalom EO is a proficient and capable supplier and manufacturer of optical lens components. The calcium fluoride we use to fabricate optical lenses exhibits high purities to ensure minimized OH contents, which are harmful to IR transmission. Shalom EO also leverages a stringent inspection procedure to ensure that the actual parameters of the lenses comply with our published specifications.

Specifications:

Lens Form	Plano-concave Lens	Material	CaF2
Diameters(mm)	12.7-25.4mm (Standard), or Custom	Working Wavelength Range	180-8000nm
Coating	Standard Uncoated, or Custom BBAR/V-coating/MgF2	Surface Quality (S/D)	80/50
Irregularity@632.8nm	λ/4-λ	Centering Error	<3 arc min
Clear Aperture	>80%	Protective Chamfer	0.2mmx45°

Product List of CaF2 Plano-Concave Lenses

Code	Material	Dia	CT	ET	Focal Length	Coating	Price
1110-001	CaF2	12.7mm	2.0mm	5.3mm	-18	Uncoated	$54.50
1110-002	CaF3	12.7mm	2.0mm	4.6mm	-25	Uncoated	$54.50
1110-003	CaF4	25.4mm	2.5mm	7.5mm	-40	Uncoated	$72.50
1110-004	CaF5	25.4mm	2.5mm	5.1mm	-75	Uncoated	$72.50
1110-005	CaF6	25.4mm	3.0mm	4.9mm	-100	Uncoated	$72.50
1110-006	CaF7	25.4mm	3.5mm	4.4mm	-200	Uncoated	$72.50
1110-007	CaF8	25.4mm	4.0mm	4.4mm	-500	Uncoated	$72.50

Biconvex Lenses

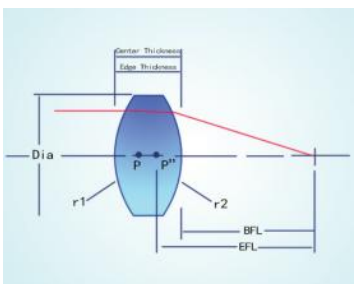


A Biconvex Lens, also known as a Double Convex Lens, is an optical lens with two identical spherical sides that have the same curvature radii. The major uses of Biconvex lenses include laser beam modulation, light focus, and imaging. Biconvex lenses have positive focal lengths and converge collimated light to a point. When the absolute finite conjugate ratio (the absolute conjugate ratio is the ratio between object distance and image distance in absolute value) is equivalent to or near 1:1, biconvex lenses are recommended, and the phrase "near 1:1" here means biconvex lenses are the best option for conjugate ratios between 1:5 and 5:1. If not, plano-convex lenses are preferable since their asymmetric shapes help to reduce spherical aberrations. The focal lengths of the biconvex lenses could be calculated using the formula: f= (R1*R2)/((n-1) *(R2-R1)).

Shalom EO offers stocked N-BK7 Biconvex Lenses, Stocked UV Fused Silica Biconvex Lenses, and Custom Biconvex Lenses. Regarding the N-BK7 Biconvex Lenses, within our stock list, a wide range of focal lengths of 10-1000mm and diameters of 6.0-50.8mm are available. Besides the uncoated versions, we also provide standard N-BK7 double convex lenses with three kinds of broadband AR coatings: 350-650nm, 650-1050 nm, and 1050-1580 nm to increase the transmission and elevate the efficiencies of utilization. Regarding the UV Fused Silica Biconvex Lenses, a wide range of focal lengths of 10-1000mm and diameters of 5.0-50.8mm are available. The UV Fused Silica double convex lenses in our stock list are uncoated, to further enhance the transmission of the UV Fused Silica double convex lenses, designed coatings could be tailored according to customers' requirements. Custom biconvex lenses made from BaF2, CaF2, MgF2, Ge, ZnSe, Sapphire, and other optical materials are also accessible upon your request.

UV Fused Silica Biconvex Lenses





- The double-convex shape is most suitable for finite conjugate ratios between 1:5 and 5:1
- A large collection of stocked biconvex lenses with focal lengths up to 1000 nm
- Made of UV Fused Silica (superior transmission from UV to NIR)
- Standardized focal lengths and diameters convenient for OEM
- Various coating options: uncoated, 350-650 nm/650-1050 nm/1050-1580 nm BBAR, or custom
- Applications: lasers, microscopes, projectors. cameras and other imaging instruments

UV Fused Silica, equivalently known as JGS1, is an optical glass material with exception transmittance to the UV wavelengths, meanwhile also being widely transparent to visible and NIR wavelengths (transmission range 200-2200 nm). UV Grade Fused Silica is one of the best ultraviolet-transmitting media. The thermal properties of UVFS are prominent, too, including high-temperature endurance and low thermal expansion. Other benefits of UV-fused silica lenses encompass few bubbles/striae, high homogeneities, chemical inertness, mechanical hardness, and advantages of birefringent properties. Therefore, the UVFS lens is a superior option for building a stable optical device under harsh working conditions.

This page features Shalom EO's Stocked UV-Fused Silica Biconvex Lenses. Within our stock list, a wide range of focal lengths of 10-1000mm and diameters of 5.0-50.8mm are available. Besides, stocked N-BK7 Biconvex Lenses and custom biconvex lenses made from BaF2, CaF2, MgF2, Ge, ZnSe, Sapphire, and other optical materials are also procurable upon your request.

Specifications:

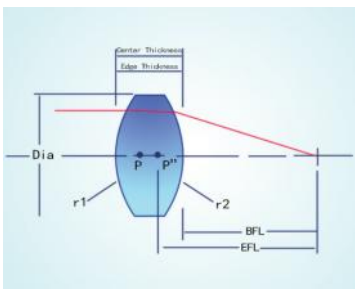
Lens Form	Biconvex Lens	Material	UV Fused Silica
Diameters(mm)	5.0-50.8mm, or Custom	Working Wavelength Range	200-2200nm
Coating	Uncoated/Custom Coatings	Surface Quality (S/D)	40/20
Irregularity@632.8nm	λ/4-λ	Centering Error	≤2 arc min
Clear Aperture	>90%	Protective Chamfer	<0.2mmx45°

Product List of UV Fused Silica Biconvex Lenses

Code	Material	Diameter	CT	ET	Focal Length	Coating	Price
1107-045	UV Fused Silica	5mm	2.2mm	1.5mm	10mm	Uncoated	$17.50
1107-046	UV Fused Silica	6mm	2.6mm	1.5mm	10mm	Uncoated	$17.50
1107-047	UV Fused Silica	6mm	2.2mm	1.5mm	15mm	Uncoated	$17.50
1107-048	UV Fused Silica	6mm	2mm	1.5mm	20mm	Uncoated	$17.50
1107-049	UV Fused Silica	6mm	1.8mm	1.5mm	30mm	Uncoated	$17.50
1107-050	UV Fused Silica	12.7mm	4.2mm	1.8mm	20mm	Uncoated	$17.50
1107-051	UV Fused Silica	12.7mm	3.3mm	1.8mm	30mm	Uncoated	$17.50
1107-052	UV Fused Silica	12.7mm	2.9mm	1.8mm	40mm	Uncoated	$17.50
1107-053	UV Fused Silica	12.7mm	2.7mm	1.8mm	50mm	Uncoated	$17.50
1107-054	UV Fused Silica	12.7mm	2.4mm	1.8mm	75mm	Uncoated	$17.50
1107-055	UV Fused Silica	12.7mm	2.2mm	1.8mm	100mm	Uncoated	$17.50
1107-056	UV Fused Silica	25.4mm	7.4mm	2mm	35mm	Uncoated	$42.00
1107-057	UV Fused Silica	25.4mm	6.7mm	2mm	40mm	Uncoated	$42.00
1107-058	UV Fused Silica	25.4mm	5.7mm	2mm	50mm	Uncoated	$42.00
1107-059	UV Fused Silica	25.4mm	4.4mm	2mm	75mm	Uncoated	$42.00
1107-060	UV Fused Silica	25.4mm	3.8mm	2mm	100mm	Uncoated	$42.00
1107-061	UV Fused Silica	25.4mm	3.4mm	2mm	125mm	Uncoated	$42.00
1107-062	UV Fused Silica	25.4mm	3.2mm	2mm	150mm	Uncoated	$42.00
1107-063	UV Fused Silica	25.4mm	3mm	2mm	175mm	Uncoated	$42.00
1107-064	UV Fused Silica	25.4mm	2.9mm	2mm	200mm	Uncoated	$42.00
1107-065	UV Fused Silica	25.4mm	2.7mm	2mm	250mm	Uncoated	$42.00
1107-066	UV Fused Silica	25.4mm	2.6mm	2mm	300mm	Uncoated	$43.50
1107-067	UV Fused Silica	25.4mm	2.4mm	2mm	500mm	Uncoated	$43.50
1107-068	UV Fused Silica	25.4mm	2.2mm	2mm	750mm	Uncoated	$43.50
1107-069	UV Fused Silica	25.4mm	2.2mm	2mm	1000mm	Uncoated	$43.50
1107-070	UV Fused Silica	50.8mm	15.6mm	2.5mm	60mm	Uncoated	$87.00
1107-071	UV Fused Silica	50.8mm	12.5mm	2.5mm	75mm	Uncoated	$87.00
1107-072	UV Fused Silica	50.8mm	10.3mm	3mm	100mm	Uncoated	$87.00
1107-073	UV Fused Silica	50.8mm	7.8mm	3mm	150mm	Uncoated	$87.00
1107-074	UV Fused Silica	50.8mm	6.5mm	3mm	200mm	Uncoated	$87.00
1107-075	UV Fused Silica	50.8mm	5.8mm	3mm	250mm	Uncoated	$87.00
1107-076	UV Fused Silica	50.8mm	5.4mm	3mm	300mm	Uncoated	$88.50
1107-077	UV Fused Silica	50.8mm	4.4mm	3mm	500mm	Uncoated	$88.50
1107-078	UV Fused Silica	50.8mm	3.9mm	3mm	750mm	Uncoated	$88.50
1107-079	UV Fused Silica	50.8mm	3.7mm	3mm	1000mm	Uncoated	$88.50

N-BK7 Biconvex Lenses





- The double-convex shape is most suitable for finite conjugate ratios between 1:5 and 5:1.
- A large collection of stocked biconvex lenses with focal lengths up to 1000nm
- Made from N-BK7 (excellent transmission from visible to the NIR region)
- Standardized focal lengths and diameters convenient for OEM
- Various coating options: uncoated, 350-650 nm/650-1050 nm/1050-1580 nm BBAR, or custom
- Applications: lasers, microscopes, projectors. cameras and other imaging instruments

N-BK7 is a kind of optical glass often used for manufacturing optical components, including lenses. N-BK7 glass is known for its low cost, high optical transmission across the visible spectrum and into the near-infrared region (350-2200nm), low dispersion, high hardness and resistance to scratches and abrasions, and the ability to withstand changes in temperature without significant expansion or contraction. It belongs to the Schott glass catalog, and is one of the most common optical glass materials.

This page features Shalom EO's Stocked N-BK7 Biconvex Lenses. Within our stock list, a wide range of focal lengths of 10-1000mm and diameters of 6.0-50.8mm are available.

Specifications:

Lens Form	Biconvex Lens	Material	N-BK7
Diameters(mm)	Standard 6.0-50.8mm, or Custom	Working Wavelength Range	350-2200nm
Coating	Uncoated/BBAR 350-650nm, 650-1050nm, 1050-1580nm, or Custom	Surface Quality (S/D)	40/20
Irregularity@632.8nm	λ/4-λ	Centering Error	≤2 arc min
Clear Aperture	>90%	Protective Chamfer	<0.2mmx45°

Product List of N-BK7 Biconvex Lenses

Code	Material	Diameter	CT	ET	Focal Length	Coating	Price
1107-001	N-BK7	6mm	2.4mm	1.5mm	10mm	Uncoated	$12.00
1107-001A	N-BK7	6mm	2.4mm	1.5mm	10mm	350-650nm AR Coating	$18.50
1107-001B	N-BK7	6mm	2.4mm	1.5mm	10mm	650-1050nm AR Coating	$18.50
1107-00C	N-BK7	6mm	2.4mm	1.5mm	10mm	1050-1580nm AR Coating	$22.00
1107-002	N-BK7	6mm	2.3mm	1.5mm	12mm	Uncoated	$12.00
1107-002A	N-BK7	6mm	2.3mm	1.5mm	12mm	350-650nm AR Coating	$18.50
1107-002B	N-BK7	6mm	2.3mm	1.5mm	12mm	650-1050nm AR Coating	$18.50
1107-002C	N-BK7	6mm	2.3mm	1.5mm	12mm	1050-1580nm AR Coating	$22.00
1107-003	N-BK7	6mm	2.1mm	1.5mm	15mm	Uncoated	$12.00
1107-003A	N-BK7	6mm	2.1mm	1.5mm	15mm	350-650nm AR Coating	$18.50
1107-003B	N-BK7	6mm	2.1mm	1.5mm	15mm	650-1050nm AR Coating	$18.50
1107-003C	N-BK7	6mm	2.1mm	1.5mm	15mm	1050-1580nm AR Coating	$22.00
1107-004	N-BK7	6mm	1.8mm	1.5mm	30mm	Uncoated	$11.50
1107-004A	N-BK7	6mm	1.8mm	1.5mm	30mm	350-650nm AR Coating	$17.50
1107-004B	N-BK7	6mm	1.8mm	1.5mm	30mm	650-1050nm AR Coating	$17.50
1107-004C	N-BK7	6mm	1.8mm	1.5mm	30mm	1050-1580nm AR Coating	$18.00
1107-005	N-BK7	9mm	3.6mm	1.8mm	12mm	Uncoated	$12.00
1107-005A	N-BK7	9mm	3.6mm	1.8mm	12mm	350-650nm AR Coating	$18.50
1107-005B	N-BK7	9mm	3.6mm	1.8mm	12mm	650-1050nm AR Coating	$18.50
1107-005C	N-BK7	9mm	3.6mm	1.8mm	12mm	1050-1580nm AR Coating	$22.00

Product List of N-BK7 Biconvex Lenses

Code	Material	Diameter	CT	ET	Focal Length	Coating	Price
1107-006	N-BK7	9mm	2.8mm	1.8mm	20mm	Uncoated	$11.50
1107-006A	N-BK7	9mm	2.8mm	1.8mm	20mm	350-650nm AR Coating	$17.50
1107-006B	N-BK7	9mm	2.8mm	1.8mm	20mm	650-1050nm AR Coating	$17.50
1107-006C	N-BK7	9mm	2.8mm	1.8mm	20mm	1050-1580nm AR Coating	$18.00
1107-007	N-BK7	12.7mm	4.7mm	1.8mm	15mm	Uncoated	$12.00
1107-007A	N-BK7	12.7mm	4.7mm	1.8mm	15mm	350-650nm AR Coating	$18.50
1107-007B	N-BK7	12.7mm	4.7mm	1.8mm	15mm	650-1050nm AR Coating	$18.50
1107-007C	N-BK7	12.7mm	4.7mm	1.8mm	15mm	1050-1580nm AR Coating	$22.00
1107-008	N-BK7	12.7mm	3.9mm	1.8mm	20mm	Uncoated	$11.50
1107-008A	N-BK7	12.7mm	3.9mm	1.8mm	20mm	350-650nm AR Coating	$17.50
1107-008B	N-BK7	12.7mm	3.9mm	1.8mm	20mm	650-1050nm AR Coating	$17.50
1107-008C	N-BK7	12.7mm	3.9mm	1.8mm	20mm	1050-1580nm AR Coating	$18.00
1107-009	N-BK7	12.7mm	3.4mm	1.8mm	25mm	Uncoated	$11.50
1107-009A	N-BK7	12.7mm	3.4mm	1.8mm	25mm	350-650nm AR Coating	$17.50
1107-009B	N-BK7	12.7mm	3.4mm	1.8mm	25mm	650-1050nm AR Coating	$17.50
1107-009C	N-BK7	12.7mm	3.4mm	1.8mm	25mm	1050-1580nm AR Coating	$18.00
1107-010	N-BK7	12.7mm	3.1mm	1.8mm	30mm	Uncoated	$11.50
1107-010A	N-BK7	12.7mm	3.1mm	1.8mm	30mm	350-650nm AR Coating	$17.50
1107-010B	N-BK7	12.7mm	3.1mm	1.8mm	30mm	650-1050nm AR Coating	$17.50
1107-010C	N-BK7	12.7mm	3.1mm	1.8mm	30mm	1050-1580nm AR Coating	$18.00
1107-011	N-BK7	12.7mm	2.8mm	1.8mm	40mm	Uncoated	$11.50
1107-011A	N-BK7	12.7mm	2.8mm	1.8mm	40mm	350-650nm AR Coating	$17.50
1107-011B	N-BK7	12.7mm	2.8mm	1.8mm	40mm	650-1050nm AR Coating	$17.50
1107-011C	N-BK7	12.7mm	2.8mm	1.8mm	40mm	1050-1580nm AR Coating	$18.00
1107-012	N-BK7	12.7mm	2.6mm	1.8mm	50mm	Uncoated	$11.50
1107-012A	N-BK7	12.7mm	2.6mm	1.8mm	50mm	350-650nm AR Coating	$17.50
1107-012B	N-BK7	12.7mm	2.6mm	1.8mm	50mm	650-1050nm AR Coating	$17.50
1107-012C	N-BK7	12.7mm	2.6mm	1.8mm	50mm	1050-1580nm AR Coating	$18.00
1107-013	N-BK7	12.7mm	2.2mm	1.8mm	100mm	Uncoated	$11.50
1107-013A	N-BK7	12.7mm	2.2mm	1.8mm	100mm	350-650nm AR Coating	$17.50
1107-013B	N-BK7	12.7mm	2.2mm	1.8mm	100mm	650-1050nm AR Coating	$17.50
1107-013C	N-BK7	12.7mm	2.2mm	1.8mm	100mm	1050-1580nm AR Coating	$18.00
1107-014	N-BK7	25.4mm	9mm	1.9mm	25.4mm	Uncoated	$12.00
1107-014A	N-BK7	25.4mm	9mm	1.9mm	25.4mm	350-650nm AR Coating	$18.00
1107-014B	N-BK7	25.4mm	9mm	1.9mm	25.4mm	650-1050nm AR Coating	$18.00
1107-014C	N-BK7	25.4mm	9mm	1.9mm	25.4mm	1050-1580nm AR Coating	$19.00
1107-015	N-BK7	25.4mm	7.7mm	2mm	30mm	Uncoated	$12.00
1107-015A	N-BK7	25.4mm	7.7mm	2mm	30mm	350-650nm AR Coating	$18.00
1107-015B	N-BK7	25.4mm	7.7mm	2mm	30mm	650-1050nm AR Coating	$18.00
1107-015C	N-BK7	25.4mm	7.7mm	2mm	30mm	1050-1580nm AR Coating	$19.00
1107-016	N-BK7	25.4mm	6.8mm	2mm	35mm	Uncoated	$12.00
1107-016A	N-BK7	25.4mm	6.8mm	2mm	35mm	350-650nm AR Coating	$18.00
1107-016B	N-BK7	25.4mm	6.8mm	2mm	35mm	650-1050nm AR Coating	$18.00
1107-016C	N-BK7	25.4mm	6.8mm	2mm	35mm	1050-1580nm AR Coating	$19.00
1107-017	N-BK7	25.4mm	6.1mm	2mm	40mm	Uncoated	$12.00
1107-017A	N-BK7	25.4mm	6.1mm	2mm	40mm	350-650nm AR Coating	$18.00
1107-017B	N-BK7	25.4mm	6.1mm	2mm	40mm	650-1050nm AR Coating	$18.00
1107-017C	N-BK7	25.4mm	6.1mm	2mm	40mm	1050-1580nm AR Coating	$19.00
1107-018	N-BK7	25.4mm	5.2mm	2mm	50mm	Uncoated	$12.00
1107-018A	N-BK7	25.4mm	5.2mm	2mm	50mm	350-650nm AR Coating	$18.00
1107-018B	N-BK7	25.4mm	5.2mm	2mm	50mm	650-1050nm AR Coating	$18.00
1107-018C	N-BK7	25.4mm	5.2mm	2mm	50mm	1050-1580nm AR Coating	$19.00
1107-019	N-BK7	25.4mm	4.7mm	2mm	60mm	Uncoated	$12.00
1107-019A	N-BK7	25.4mm	4.7mm	2mm	60mm	350-650nm AR Coating	$18.00
1107-019B	N-BK7	25.4mm	4.7mm	2mm	60mm	650-1050nm AR Coating	$18.00
1107-019C	N-BK7	25.4mm	4.7mm	2mm	60mm	1050-1580nm AR Coating	$19.00
1107-020	N-BK7	25.4mm	4.1mm	2mm	75mm	Uncoated	$12.00
1107-020A	N-BK7	25.4mm	4.1mm	2mm	75mm	350-650nm AR Coating	$18.00
1107-020B	N-BK7	25.4mm	4.1mm	2mm	75mm	650-1050nm AR Coating	$18.00
1107-020C	N-BK7	25.4mm	4.1mm	2mm	75mm	1050-1580nm AR Coating	$19.00
1107-021	N-BK7	25.4mm	3.6mm	2mm	100mm	Uncoated	$12.00
1107-021A	N-BK7	25.4mm	3.6mm	2mm	100mm	350-650nm AR Coating	$18.00
1107-021B	N-BK7	25.4mm	3.6mm	2mm	100mm	650-1050nm AR Coating	$18.00
1107-021C	N-BK7	25.4mm	3.6mm	2mm	100mm	1050-1580nm AR Coating	$19.00
1107-022	N-BK7	25.4mm	3.3mm	2mm	125mm	Uncoated	$12.00
1107-022A	N-BK7	25.4mm	3.3mm	2mm	125mm	350-650nm AR Coating	$18.00
1107-022B	N-BK7	25.4mm	3.3mm	2mm	125mm	650-1050nm AR Coating	$18.00
1107-022C	N-BK7	25.4mm	3.3mm	2mm	125mm	1050-1580nm AR Coating	$19.00
1107-023	N-BK7	25.4mm	3.1mm	2mm	150mm	Uncoated	$12.00
1107-023A	N-BK7	25.4mm	3.1mm	2mm	150mm	350-650nm AR Coating	$18.00
1107-023B	N-BK7	25.4mm	3.1mm	2mm	150mm	650-1050nm AR Coating	$18.00
1107-023C	N-BK7	25.4mm	3.1mm	2mm	150mm	1050-1580nm AR Coating	$19.00
1107-024	N-BK7	25.4mm	2.9mm	2mm	175mm	Uncoated	$12.00
1107-024A	N-BK7	25.4mm	2.9mm	2mm	175mm	350-650nm AR Coating	$18.00
1107-024B	N-BK7	25.4mm	2.9mm	2mm	175mm	650-1050nm AR Coating	$18.00
1107-024C	N-BK7	25.4mm	2.9mm	2mm	175mm	1050-1580nm AR Coating	$19.00
1107-025	N-BK7	25.4mm	2.8mm	2mm	200mm	Uncoated	$12.00
1107-025A	N-BK7	25.4mm	2.8mm	2mm	200mm	350-650nm AR Coating	$18.00

Product List of N-BK7 Biconvex Lenses

Code	Material	Diameter	CT	ET	Focal length	Coating	Unit Price
1107-025B	N-BK7	25.4mm	2.0mm	2.8mm	200mm	650-1050nm AR Coating	$18.0
1107-025C	N-BK7	25.4mm	2.0mm	2.8mm	200mm	1050-1580nm AR Coating	$19.0
1107-026	N-BK7	25.4mm	2.0mm	2.6mm	250mm	Uncoated	$12.0
1107-026A	N-BK7	25.4mm	2.0mm	2.6mm	250mm	350-650nm AR Coating	$18.0
1107-026B	N-BK7	25.4mm	2.0mm	2.6mm	250mm	650-1050nm AR Coating	$18.0
1107-026C	N-BK7	25.4mm	2.0mm	2.6mm	250mm	1050-1580nm AR Coating	$19.0
1107-027	N-BK7	25.4mm	2.0mm	2.5mm	300mm	Uncoated	$13.5
1107-027A	N-BK7	25.4mm	2.0mm	2.5mm	300mm	350-650nm AR Coating	$20.0
1107-027B	N-BK7	25.4mm	2.0mm	2.5mm	300mm	650-1050nm AR Coating	$20.0
1107-027C	N-BK7	25.4mm	2.0mm	2.5mm	300mm	1050-1580nm AR Coating	$22.0
1107-028	N-BK7	25.4mm	2.0mm	2.4mm	400mm	Uncoated	$13.5
1107-028A	N-BK7	25.4mm	2.0mm	2.4mm	400mm	350-650nm AR Coating	$20.0
1107-028C	N-BK7	25.4mm	2.0mm	2.4mm	400mm	1050-1580nm AR Coating	$22.0
1107-028B	N-BK7	25.4mm	2.0mm	2.4mm	400mm	650-1050nm AR Coating	$20.0
1107-029	N-BK7	25.4mm	2.0mm	2.3mm	500mm	Uncoated	$13.5
1107-029A	N-BK7	25.4mm	2.0mm	2.3mm	500mm	350-650nm AR Coating	$18.5
1107-029B	N-BK7	25.4mm	2.0mm	2.3mm	500mm	650-1050nm AR Coating	$19.0
1107-029C	N-BK7	25.4mm	2.0mm	2.3mm	500mm	1050-1580nm AR Coating	$22.5
1107-030	N-BK7	25.4mm	2.0mm	2.2mm	750mm	Uncoated	$13.5
1107-030A	N-BK7	25.4mm	2.0mm	2.2mm	750mm	350-650nm AR Coating	$19.0
1107-030B	N-BK7	25.4mm	2.0mm	2.2mm	750mm	650-1050nm AR Coating	$19.0
1107-030C	N-BK7	25.4mm	2.0mm	2.2mm	750mm	1050-1580nm AR Coating	$22.5
1107-031	N-BK7	25.4mm	2.0mm	2.2mm	1000mm	Uncoated	$13.5
1107-031A	N-BK7	25.4mm	2.0mm	2.2mm	1000mm	350-650nm AR Coating	$19.0
1107-031B	N-BK7	25.4mm	2.0mm	2.2mm	1000mm	650-1050nm AR Coating	$19.0
1107-031C	N-BK7	25.4mm	2.0mm	2.2mm	1000mm	1050-1580nm AR Coating	$22.5
1107-032	N-BK7	50.8mm	3.0mm	14.4mm	60mm	Uncoated	$22.0
1107-032B	N-BK7	50.8mm	3.0mm	14.4mm	60mm	650-1050nm AR Coating	$32.5
1107-032C	N-BK7	50.8mm	3.0mm	14.4mm	60mm	1050-1580nm AR Coating	$33.5
1107-033	N-BK7	50.8mm	3.0mm	11.8mm	75mm	Uncoated	$22.0
1107-033A	N-BK7	50.8mm	3.0mm	11.8mm	75mm	350-650nm AR Coating	$32.5
1107-033B	N-BK7	50.8mm	3.0mm	11.8mm	75mm	650-1050nm AR Coating	$32.5
1107-033C	N-BK7	50.8mm	3.0mm	11.8mm	75mm	1050-1580nm AR Coating	$33.5
1107-034	N-BK7	50.8mm	3.0mm	9.5mm	100mm	Uncoated	$22.0
1107-034A	N-BK7	50.8mm	3.0mm	9.5mm	100mm	350-650nm AR Coating	$32.5
1107-034B	N-BK7	50.8mm	3.0mm	9.5mm	100mm	650-1050nm AR Coating	$32.5
1107-034C	N-BK7	50.8mm	3.0mm	9.5mm	100mm	1050-1580nm AR Coating	$33.5
1107-035	N-BK7	50.8mm	3.0mm	8.1mm	125mm	Uncoated	$22.0
1107-035A	N-BK7	50.8mm	3.0mm	8.1mm	125mm	350-650nm AR Coating	$32.5
1107-035B	N-BK7	50.8mm	3.0mm	8.1mm	125mm	650-1050nm AR Coating	$32.5
1107-035C	N-BK7	50.8mm	3.0mm	8.1mm	125mm	1050-1580nm AR Coating	$33.5
1107-036	N-BK7	50.8mm	3.0mm	7.2mm	150mm	Uncoated	$22.0
1107-036A	N-BK7	50.8mm	3.0mm	7.2mm	150mm	350-650nm AR Coating	$32.5
1107-036B	N-BK7	50.8mm	3.0mm	7.2mm	150mm	650-1050nm AR Coating	$32.5
1107-036C	N-BK7	50.8mm	3.0mm	7.2mm	150mm	1050-1580nm AR Coating	$33.5
1107-037	N-BK7	50.8mm	3.0mm	6.6mm	175mm	Uncoated	$22.0
1107-037A	N-BK7	50.8mm	3.0mm	6.6mm	175mm	350-650nm AR Coating	$32.5
1107-037B	N-BK7	50.8mm	3.0mm	6.6mm	175mm	650-1050nm AR Coating	$32.5
1107-037C	N-BK7	50.8mm	3.0mm	6.6mm	175mm	1050-1580nm AR Coating	$33.5
1107-038	N-BK7	50.8mm	3.0mm	6.2mm	200mm	Uncoated	$22.0
1107-038A	N-BK7	50.8mm	3.0mm	6.2mm	200mm	350-650nm AR Coating	$32.5
1107-038B	N-BK7	50.8mm	3.0mm	6.2mm	200mm	650-1050nm AR Coating	$32.5
1107-038C	N-BK7	50.8mm	3.0mm	6.2mm	200mm	1050-1580nm AR Coating	$33.5
1107-039	N-BK7	50.8mm	3.0mm	5.5mm	250mm	Uncoated	$22.0
1107-039A	N-BK7	50.8mm	3.0mm	5.5mm	250mm	350-650nm AR Coating	$32.5
1107-039B	N-BK7	50.8mm	3.0mm	5.5mm	250mm	650-1050nm AR Coating	$32.5
1107-039C	N-BK7	50.8mm	3.0mm	5.5mm	250mm	1050-1580nm AR Coating	$33.5
1107-040	N-BK7	50.8mm	3.0mm	5.1mm	300mm	Uncoated	$23.5
1107-040A	N-BK7	50.8mm	3.0mm	5.1mm	300mm	350-650nm AR Coating	$34.0
1107-040B	N-BK7	50.8mm	3.0mm	5.1mm	300mm	650-1050nm AR Coating	$34.0
1107-040C	N-BK7	50.8mm	3.0mm	5.1mm	300mm	1050-1580nm AR Coating	$34.5
1107-041	N-BK7	50.8mm	3.0mm	4.6mm	400mm	Uncoated	$23.5
1107-041A	N-BK7	50.8mm	3.0mm	4.6mm	400mm	350-650nm AR Coating	$34.0
1107-041B	N-BK7	50.8mm	3.0mm	4.6mm	400mm	650-1050nm AR Coating	$34.0
1107-041C	N-BK7	50.8mm	3.0mm	4.6mm	400mm	1050-1580nm AR Coating	$34.5
1107-042	N-BK7	50.8mm	3.0mm	4.3mm	500mm	Uncoated	$23.5
1107-042A	N-BK7	50.8mm	3.0mm	4.3mm	500mm	350-650nm AR Coating	$34.0
1107-042B	N-BK7	50.8mm	3.0mm	4.3mm	500mm	650-1050nm AR Coating	$34.0
1107-042C	N-BK7	50.8mm	3.0mm	4.3mm	500mm	1050-1580nm AR Coating	$34.5
1107-043	N-BK7	50.8mm	3.0mm	3.8mm	750mm	Uncoated	$23.5
1107-043A	N-BK7	50.8mm	3.0mm	3.8mm	750mm	350-650nm AR Coating	$34.0
1107-043B	N-BK7	50.8mm	3.0mm	3.8mm	750mm	650-1050nm AR Coating	$34.0
1107-043C	N-BK7	50.8mm	3.0mm	3.8mm	750mm	1050-1580nm AR Coating	$34.5
1107-044	N-BK7	50.8mm	3.0mm	3.6mm	1000mm	Uncoated	$23.5
1107-044A	N-BK7	50.8mm	3.0mm	3.6mm	1000mm	350-650nm AR Coating	$34.0
1107-044B	N-BK7	50.8mm	3.0mm	3.6mm	1000mm	650-1050nm AR Coating	$34.0
1107-044C	N-BK7	50.8mm	3.0mm	3.6mm	1000mm	1050-1580nm AR Coating	$34.5

Biconcave Lenses



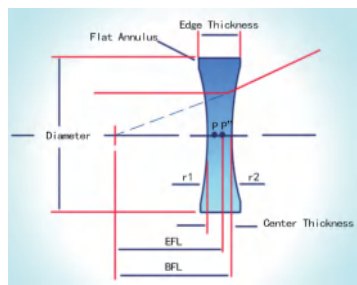
A biconcave lens or double concave lens is an optical lens with two identical inward-bent spherical surfaces with equal radii of curvature. A double concave lens has a negative focal length and diverges a collimated light beam to the virtual focal point (that is the point at which the extension lines of the diverging light path intersect at the object side of the concave lens). The usages of Biconcave lenses are diverse, encompassing divergence of collimated or focused light beams, beam diameter modulation (e.g., Galilean beam expanders), the correction of spherical aberration of optical assemblies, and increasing the focal lengths of a lens group, etc. Due to its symmetric structure, a double concave lens works best when the conjugate ratio (object distance: image distance) is close or equal to 1:1. In such situations, the distortion, spherical/chromatic aberration, and coma could be offset as a result of the equilibrium of the lenses. Whilst, when the intended magnification ratio is <1/5 or >5, a Plano concave lens will be a better alternative.

Hangzhou Shalom EO offers Off-the-shelf N-BK7 Biconcave Lenses, Off-the-shelf UV Fused Silica Biconcave Lenses, and Custom Biconcave Lenses made of BaF2, CaF2, MgF2, Ge, ZnSe, Sapphire, and other optical materials.

The stock N-BK7 Bi-concave Lenses have four standard coating options: uncoated, 350-650nm, 650-1100 nm, and 1050-1580nm broadband anti-reflection (BBAR) coatings. Shalom EO's stock UV Fused Silica Bi-concave Lenses only have uncoated versions so far. Custom V-coatings that exhibit optimized transmission and low-cost MgF2 AR coatings with various transmission wavelengths could be furnished onto UVFS biconcave lenses upon request.

N-BK7 Biconcave Lenses





- Double concave structure recommended for absolute conjugate ratio close to 1:1
- Made from N-BK7 (excellent transmission from visible to the NIR region)
- Standardized focal lengths and diameters convenient for OEM
- Various standard and custom coating options, focal lengths (standard -6 to -100mm)
- Applications: Galilean laser beam expander, optical character readers, viewers, and projectors
- Custom Biconcave Lenses made from different materials are available

N-BK7 is a kind of optical glass often used for manufacturing optical components, including lenses. N-BK7 glass is known for its low cost, high optical transmission across the visible spectrum and into the near-infrared region (350-2200nm), low dispersion, high hardness and resistance to scratches and abrasions, and the ability to withstand changes in temperature without significant expansion or contraction. It belongs to the Schott glass catalog, and is one of the most common optical glass materials.

Shalom EO's stock N-BK7 Bi-concave Lenses have four standard coating options: uncoated, 350-650nm, 650-1100 nm, and 1050-1580nm broadband anti-reflection (BBAR) coatings. Custom V-coatings that exhibit optimized transmission and low-cost MgF2 AR coatings with various transmission wavelengths could be furnished onto the N-BK7 and UVFS biconcave lenses upon request. Besides the stocked N-BK7 and UV Fused Silica Biconcave lenses, Shalom EO also provides off-the-shelf UV Fused Silica biconcave lenses and custom biconcave lenses made from BaF2, CaF2, MgF2, Ge, ZnSe, Sapphire, and other optical materials.

Specifications:

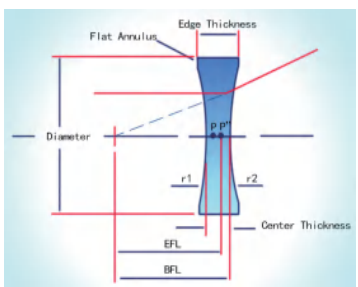
Type	Biconcave Lenses	Material	N-BK7(H-K9L)
Clear Aperture	>90%	Diameter Tolerance	+0.00/-0.1mm
Thickness Tolerance	±0.1mm	Surface Irregularity	λ/4-λ@633nm
Centering Error	3 arcmin	Focal Length Tolerance	+/-1%
Chamfer	0.2mm x 45 degree		

Product List of N-BK7 Biconcave Lenses

Code	Material	Diameter	CT	ET	Focal Length	Coating	Price
1108-006	N-BK7	12.7mm	2.5mm	4.1mm	-25mm	Uncoated	$11.50
1108-006A	N-BK7	12.7mm	2.5mm	4.1mm	-25mm	350-650nm AR Coating	$17.50
1108-006B	N-BK7	12.7mm	2.5mm	4.1mm	-25mm	650-1050nm AR Coating	$17.50
1108-006C	N-BK7	12.7mm	2.5mm	4.1mm	-25mm	1050-1580nm AR Coating	$18.00
1108-008	N-BK7	12.7mm	3mm	4.3mm	-30mm	Uncoated	$11.50
1108-008A	N-BK7	12.7mm	3mm	4.3mm	-30mm	350-650nm AR Coating	$17.50
1108-008B	N-BK7	12.7mm	3mm	4.3mm	-30mm	650-1050nm AR Coating	$17.50
1108-008C	N-BK7	12.7mm	3mm	4.3mm	-30mm	1050-1580nm AR Coating	$18.00
1108-010	N-BK7	12.7mm	3.5mm	4.3mm	-50mm	Uncoated	$11.50
1108-010A	N-BK7	12.7mm	3.5mm	4.3mm	-50mm	350-650nm AR Coating	$17.50
1108-010B	N-BK7	12.7mm	3.5mm	4.3mm	-50mm	650-1050nm AR Coating	$17.50
1108-010C	N-BK7	12.7mm	3.5mm	4.3mm	-50mm	1050-1580nm AR Coating	$18.00
1108-013	N-BK7	25.4mm	3mm	6.1mm	-50mm	Uncoated	$12.00
1108-013A	N-BK7	25.4mm	3mm	6.1mm	-50mm	350-650nm AR Coating	$18.00
1108-013B	N-BK7	25.4mm	3mm	6.1mm	-50mm	650-1050nm AR Coating	$18.00
1108-013C	N-BK7	25.4mm	3mm	6.1mm	-50mm	1050-1580nm AR Coating	$19.00
1108-015	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	Uncoated	$12.00
1108-015A	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	350-650nm AR Coating	$18.00
1108-015B	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	650-1050nm AR Coating	$18.00
1108-015C	N-BK7	25.4mm	3.5mm	5.6mm	-75mm	1050-1580nm AR Coating	$19.00
1108-017	N-BK7	25.4mm	4mm	5.6mm	-100mm	Uncoated	$12.00
1108-017A	N-BK7	25.4mm	4mm	5.6mm	-100mm	350-650nm AR Coating	$18.00
1108-017B	N-BK7	25.4mm	4mm	5.6mm	-100mm	650-1050nm AR Coating	$18.00
1108-017C	N-BK7	25.4mm	4mm	5.6mm	-100mm	1050-1580nm AR Coating	$19.00

UV Fused Silica Biconcave Lenses





- Double concave structure recommended for absolute conjugate ratio close to 1:1
- Made of UV Fused Silica (superior transmission from UV to NIR)
- Standardized focal lengths and diameters convenient for OEM
- Various standard and custom coating options, focal lengths (standard -6 to -100mm)
- Applications: Galilean laser beam expander, optical character readers, viewers, and projectors
- Custom Biconcave Lenses made from different materials are available

UV Fused Silica, equivalently known as JGS1, is an optical glass material with exception transmittance to the UV wavelengths, meanwhile also being widely transparent to visible and NIR wavelengths (transmission range 200-2200 nm). UV Grade Fused Silica is one of the best ultraviolet-transmitting media. The thermal properties of UVFS are prominent, too, including high-temperature endurance and low thermal expansion. Other benefits of UV-fused silica lenses encompass few bubbles/striae, high homogeneities, chemical inertness, mechanical hardness, and advantages of birefringent properties. Therefore, the UVFS lens is a superior option for building a stable optical device under harsh working conditions.

Shalom EO's stock UV Fused Silica Bi-concave Lenses only have uncoated versions so far. While custom V-coatings that exhibit optimized transmission and low-cost MgF2 AR coatings with various transmission wavelengths could be furnished onto UVFS biconcave lenses upon request. Besides the stocked N-BK7 and UV Fused Silica Biconcave lenses, Shalom EO also provides Standard N-BK7 biconcave lenses and custom biconcave lenses made from BaF2, CaF2, MgF2, Ge, ZnSe, Sapphire, and other optical materials.

Specifications:

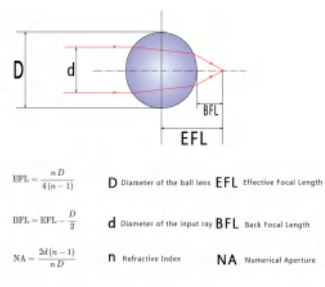
Type	Biconcave Lenses	Material	UV Fused Silica(JGS1)
Clear Aperture	>90%	Diameter Tolerance	+0.00/-0.1mm
Thickness Tolerance	±0.1mm	Surface Irregularity	λ/4-λ@633nm
Centering Error	3 arcmin	Focal Length Tolerance	+/-1%
Chamfer	0.2mm x 45 degree		

Product List of UV Fused Silica Biconcave Lenses

Code	Material	Diameter	CT	ET	Focal Length	Coating	Price
1108-001	UV Fused Silica	6.0mm	2.5mm	4.1mm	-6mm	Uncoated	$19.00
1108-002	UV Fused Silica	6.0mm	3.0mm	3.8mm	-12mm	Uncoated	$19.00
1108-003	UV Fused Silica	9.0mm	2.5mm	5.0mm	-9mm	Uncoated	$19.00
1108-004	UV Fused Silica	9.0mm	3.0mm	4.2mm	-18mm	Uncoated	$17.50
1108-005	UV Fused Silica	12.7mm	3.0mm	6.0mm	-15mm	Uncoated	$19.00
1108-007	UV Fused Silica	12.7mm	3.0mm	4.8mm	-25mm	Uncoated	$17.50
1108-009	UV Fused Silica	12.7mm	3.0mm	4.5mm	-30mm	Uncoated	$17.50
1108-011	UV Fused Silica	12.7mm	3.0mm	3.9mm	-50mm	Uncoated	$17.50
1108-012	UV Fused Silica	25.4mm	3.0mm	10.5mm	-25mm	Uncoated	$42.00
1108-014	UV Fused Silica	25.4mm	3.5mm	7.0mm	-50mm	Uncoated	$42.00
1108-016	UV Fused Silica	25.4mm	3.5mm	5.8mm	-75mm	Uncoated	$42.00
1108-018	UV Fused Silica	25.4mm	3.5mm	5.3mm	-100mm	Uncoated	$42.00

Ball Lenses





- Broad diameter range: 0.3mm to 100mm
- Substrate Materials: Sapphire, N-BK7, UV Fused Silica, Ruby, Ge, ZnSe, and other High-Refractive-Index Glass
- Coating Options: None or AR Coatings
- Applications: fiber coupling, objective lenses for endoscopes, bar code scanning, and sensors, pre-forms of Aspheric Lenses

Ball Lenses are a special form of biconvex lenses that inherit the geometry of a ball (which implies spherical surfaces all around the perimeter of the lens), manufactured from a single material with the optical transmission sited in the wavelength region of interest. The predominant function of ball lenses is light collimation/coupling for optical fibers (e.g., laser-to-fiber coupling, fiber-to-fiber coupling), with other versatile possibilities to be incorporated in miniature optics (e.g., Barcode Scanning, Sensors, or objective lenses, etc.). Ball Lenses could also be considered as pre-forms of aspheric lenses. One advantage of a ball lens is its short Back Focal Length (BFL), a trait that cuts down the distance from the optic to the fiber and is exceptionally useful when the installation space is rather tight, and compact dimension could simultaneously reduce the production cost. In addition, a ball lens is rotationally symmetric, which enhances the ease of aligning and positioning.

Hangzhou Shalom EO provides off-the-shelf Ball Lenses made from N-BK7, UV Fused Silica, and Sapphire with diameters from 1-10mm, and custom Ball Lenses of various substrate materials including Ruby, Ge, ZnSe, and other Optical Glass Materials with high refractive indices. Our Ball Lenses feature compact dimension capability, effectively liberating space limitation and high precision/low spherical aberration. For custom ball lenses, a broad diameter ranging from 0.3mm to 100mm is available.

Material Selection Guidance:

N-BK7 Ball Lenses:

N-BK7 is a high-quality borosilicate crown glass requisite for the fabrication of optics. It is one of the most prevalent optical glasses, and with its transmission range from visible to near-IR, low level of inclusions, and mechanical strength, is an excellent option whenever the extra benefits of UVFS (e.g. high transmission in the UV region) are not needed. N-BK7 also features high machineability, therefore N-BK7 ball lenses are also convenient pre-forms of Aspheric Lenses.

Working Wavelength Range: 350nm to 2200nm

Refractive Index: 1.51680 @ 587.5618 nm

Thermal Expansion: 7.1 x 10-6/K

UV Grade Fused Silica Ball Lenses :

UV Grade Fused Silica is amorphous state silicon dioxide made from fusing SiCl4 stones with high purity oxyhydrogen flame. The most outstanding attribute of UV Fused Silica is its high transmission rate in the ultraviolet region. The low coefficients of thermal expansion contribute to the high thermal stability. In addition, the material also features high chemical resistance and minimal fluorescence under UV illumination.

Working Wavelength Range: 200nm to 2200nm

Refractive Index: 1.458

Thermal Expansion: 0.57 x 10-6/℃

Sapphire Ball Lenses:

Optical grade Single Crystal Sapphire (Al2O3) Ball and Half Ball Lenses, with unrivaled surface hardness, great heat resistance, and durability to chemical corrosions, is particularly suitable for operating environments that are subject to high heat/power/pressure. The broad transmission range of Sapphire from 0.15-5.5μm is also impressive. The large Refractive Index of Sapphire suggests decreased spherical aberration.

Working Wavelength Range: 170nm-5500nm

Refractive Index: 1.77

Compressive Strength (psi): 300,000

Thermal expansion: 5.6x10-6/K (parallel), 5.0x10-6/k (perpendicular)

Specifications:

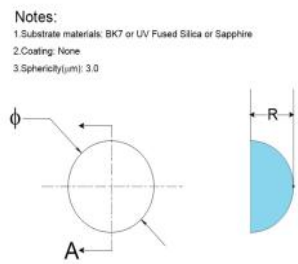
Materials	Sapphire, N-BK7, UVFS, Ruby, Ge, ZnSe, High-Refractive-Index Glass	Lens Type	Ball Lens
Diameters	0.3mm-100mm	Sphericity	Standard 2μm
Working Wavelength Range	UV to IR	Irregularity (@663nm)	λ/4
Surface Quality	40/20 S/D	Coating	None or Custom AR Coatings

Product List of Ball Lenses

Code	Types	Material	Diameter	EFL	Coating	Unit Price
1105-001	Ball	N-BK7	1.0mm	0.73mm	None	$5.5
1105-002	Ball	UV Fused Silica	1.0mm	0.80mm	None	$8.5
1105-003	Ball	Sapphire	1.0mm	0.57mm	None	$10.0
1105-004	Ball	N-BK7	2.0mm	1.47mm	None	$5.5
1105-005	Ball	UV Fused Silica	2.0mm	1.59mm	None	$8.5
1105-006	Ball	Sapphire	2.0mm	1.15mm	None	$10.0
1105-031	Ball	CDGM H-LAK8A	2.5mm	/	None	$5.5
1105-007	Ball	N-BK7	3.0mm	2.20mm	None	$5.5
1105-008	Ball	UV Fused Silica	3.0mm	2.39mm	None	$8.5
1105-009	Ball	Sapphire	3.0mm	1.72mm	None	$10.0
1105-010	Ball	N-BK7	4.0mm	2.93mm	None	$5.5
1105-011	Ball	UV Fused Silica	4.0mm	3.18mm	None	Inquiry
1105-012	Ball	Sapphire	4.0mm	2.30mm	None	$12.0
1105-013	Ball	N-BK7	5.0mm	3.67mm	None	$5.5
1105-014	Ball	UV Fused Silica	5.0mm	3.98mm	None	$10.0
1105-015	Ball	Sapphire	5.0mm	2.87mm	None	$12.0
1105-016	Ball	N-BK7	6.0mm	4.40mm	None	$7.5
1105-017	Ball	UV Fused Silica	6.0mm	4.78mm	None	$10.0
1105-018	Ball	Sapphire	6.0mm	3.45mm	None	$15.0
1105-019	Ball	N-BK7	7.0mm	5.14mm	None	$7.5
1105-020	Ball	UV Fused Silica	7.0mm	5.57mm	None	$10.0
1105-021	Ball	Sapphire	7.0mm	4.02mm	None	Inquiry
1105-022	Ball	N-BK7	8.0mm	5.87mm	None	$7.5
1105-023	Ball	UV Fused Silica	8.0mm	6.37mm	None	$12.0
1105-024	Ball	Sapphire	8.0mm	4.60mm	None	$18.5
1105-025	Ball	N-BK7	9.0mm	6.61mm	None	$7.5
1105-026	Ball	UV Fused Silica	9.0mm	7.16mm	None	$12.0
1105-027	Ball	Sapphire	9.0mm	5.17mm	None	$20.0
1105-028	Ball	N-BK7	10.0mm	7.34mm	None	$7.5
1105-029	Ball	UV Fused Silica	10.0mm	7.96mm	None	$12.0
1105-030	Ball	Sapphire	10.0mm	5.75mm	None	$23.0

Half-Ball Lenses





- Broad diameter range: 0.3mm to 100mm
- Substrate Materials: Sapphire, N-BK7, UV Fused Silica, Ruby, Ge, ZnSe, ZnS, and other High-Refractive-Index Glass
- AR coatings optional
- Applications: fiber coupling, objective lenses for endoscopes, bar code scanning, and sensors, pre-forms of Aspheric Lenses

Ball Lenses are a special form of biconvex lenses that inherit the geometry of a ball (which implies spherical surfaces all around the perimeter of the lens), manufactured from a single material with the optical transmission sited in the wavelength region of interest. The predominant function of ball lenses is light collimation/coupling for optical fibers (e.g., laser-to-fiber coupling, fiber-to-fiber coupling), with other versatile possibilities to be incorporated in miniature optics (e.g., Barcode Scanning, Sensors, or objective lenses, etc.). Ball Lenses could also be considered as pre-forms of aspheric lenses. One advantage of a ball lens is its short Back Focal Length (BFL), a trait that cuts down the distance from the optic to the fiber and is exceptionally useful when the installation space is rather tight, and compact dimension could simultaneously reduce the production cost. In addition, a ball lens is rotationally symmetric, which enhances the ease of aligning and positioning.

Half-Ball Lenses are variants of ball lenses, obtained through simply cutting the ball lenses in half. Due to the ease of mounting brought by the one flat surface, half-ball lenses are ideal for applications where more compact designs are required.

Hangzhou Shalom EO provides both stocked and custom Half Ball Lenses made from N-BK7, UV Fused Silica, Sapphire, Ruby, Ge, ZnSe, ZnS, and other optical glass materials with high refractive indices, with a broad diameter range from 0.3mm to 100mm and optional AR coatings.

Material Selection Guidance:

N-BK7 Ball Lenses:

N-BK7 is a high-quality borosilicate crown glass requisite for the fabrication of optics. It is one of the most prevalent optical glasses, and with its transmission range from visible to near-IR, low level of inclusions, and mechanical strength, is an excellent option whenever the extra benefits of UVFS (e.g. high transmission in the UV region) are not needed. N-BK7 also features high machineability, therefore N-BK7 ball lenses are also convenient pre-forms of Aspheric Lenses.

· Working Wavelength Range: 350nm to 2200nm
· Refractive Index: 1.51680 @ 587.5618 nm
· Thermal Expansion: 7.1 x 10-6/K

UV Grade Fused Silica Ball Lenses :

UV Grade Fused Silica is amorphous state silicon dioxide made from fusing SiCl4 stones with high purity oxyhydrogen flame. The most outstanding attribute of UV Fused Silica is its high transmission rate in the ultraviolet region. The low coefficients of thermal expansion contribute to the high thermal stability. In addition, the material also features high chemical resistance and minimal fluorescence under UV illumination.

· Working Wavelength Range: 200nm to 2200nm
· Refractive Index: 1.458
· Thermal Expansion: 0.57 x 10-6/℃

Sapphire Ball Lenses:

Optical grade Single Crystal Sapphire (Al2O3) Ball and Half Ball Lenses, with unrivaled surface hardness, great heat resistance, and durability to chemical corrosions, are in particular suitable for operating environments that are subject to high heat/power/pressure. The broad transmission range of Sapphire from 0.15-5.5μm is also impressive. The large Refractive Index of Sapphire suggests decreased spherical aberration.

· Working Wavelength Range: 170nm-5500nm
· Refractive Index: 1.77
· Compressive Strength (psi): 300,000
· Thermal expansion: 5.6x10-6/K (parallel), 5.0x10-6/k (perpendicular)

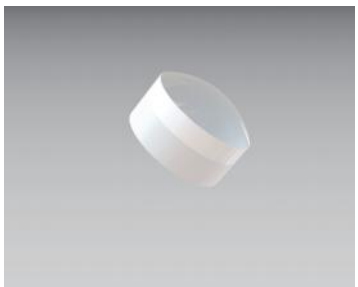
Specifications:

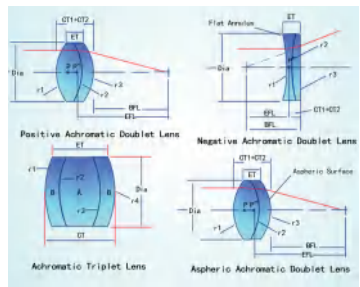
Materials	Sapphire, N-BK7, UVFS, Ruby, Ge, ZnSe, High-Refractive-Index Glass	Lens Type	Half Ball Lens
Diameters	0.3mm-100mm	Sphericity	Standard 2.0μm
Working Wavelength Range	UV to IR	Irregularity (@633nm)	λ/4
Surface Quality	40/20 S/D	Coating	None or Custom AR Coatings

Product List of Half-Ball Lenses

Code	Types	Material	Diameter	EFL	Coating	Unit Price
1106-001	Half-Ball	N-BK7	1.0mm	-	None	$8.0
1106-002	Half-Ball	UV Fused Silica	1.0mm	-	None	Inquiry
1106-003	Half-Ball	Sapphire	1.0mm	-	None	Inquiry
1106-004	Half-Ball	N-BK7	2.0mm	-	None	$8.0
1106-005	Half-Ball	UV Fused Silica	2.0mm	-	None	$8.5
1106-006	Half-Ball	Sapphire	2.0mm	-	None	$10.0
1106-007	Half-Ball	N-BK7	3.0mm	-	None	$8.0
1106-008	Half-Ball	UV Fused Silica	3.0mm	-	None	$8.5
1106-009	Half-Ball	Sapphire	3.0mm	-	None	Inquiry
1106-010	Half-Ball	N-BK7	4.0mm	-	None	$8.0
1106-011	Half-Ball	UV Fused Silica	4.0mm	-	None	$8.5
1106-012	Half-Ball	Sapphire	4.0mm	-	None	$12.0
1106-013	Half-Ball	N-BK7	5.0mm	-	None	$8.0
1106-014	Half-Ball	UV Fused Silica	5.0mm	-	None	$11.0
1106-015	Half-Ball	Sapphire	5.0mm	-	None	$12.0
1106-016	Half-Ball	N-BK7	6.0mm	-	None	$8.0
1106-017	Half-Ball	UV Fused Silica	6.0mm	-	None	$12.0
1106-018	Half-Ball	Sapphire	6.0mm	-	None	Inquiry
1106-019	Half-Ball	N-BK7	7.0mm	-	None	$8.0
1106-020	Half-Ball	UV Fused Silica	7.0mm	-	None	$12.0
1106-021	Half-Ball	Sapphire	7.0mm	-	None	Inquiry
1106-022	Half-Ball	N-BK7	8.0mm	-	None	$8.0
1106-023	Half-Ball	UV Fused Silica	8.0mm	-	None	$12.0
1106-024	Half-Ball	Sapphire	8.0mm	-	None	Inquiry
1106-025	Half-Ball	N-BK7	9.0mm	-	None	Inquiry
1106-026	Half-Ball	UV Fused Silica	9.0mm	-	None	$12.0
1106-027	Half-Ball	Sapphire	9.0mm	-	None	$21.0
1106-028	Half-Ball	N-BK7	10.0mm	-	None	$8.0
1106-029	Half-Ball	UV Fused Silica	10.0mm	-	None	$12.0
1106-030	Half-Ball	Sapphire	10.0mm	-	None	$23.0

Achromatic Doublet Lens





- Both off-the-shelf and custom positive achromatic doublet lenses and negative achromatic doublet lenses are available
- Abundant selection: standard focal lengths 7.5mm to 1000mm (positive achromatic doublet lens); -100mm to -20mm (negative achromatic doublet lens)
- Standard sizes 5-50.8mm, custom sizes 1.0mm to 300mm
- Stabilized focal lengths over designed wavelengths and more concentrated spots, better off-axis performance
- Crown glass and flint glass sourced from SCHOTT
- Coating options: 350-650nm, 650-1050nm, 1050-1580nm AR coatings, or other custom coatings

An Achromatic Doublet Lens is an optical lens component consisting of one lens made from crown glass of positive, minor refractive index and one lens made from flint glass of negative, greater refractive index cemented together. The purpose of an achromatic doublet lens is to mitigate the influence of achromatic dispersion, or chromatic aberration, an inevitable optical phenomenon, in which lights of different colors will be refracted onto different points rather than the theoretical focal point. The design of the achromatic doublet lens utilizes the compensation of the refractive characteristics of crown glass and flint glass through the matching of the converging convex lens and diverging concave lens. Compared to a simple bulk lens, an achromatic doublet enables the generation of light spots of smaller sizes and eminent image qualities without the necessity of cutting down the numerical aperture.

Shalom EO's achromatic doublet lenses are excellent for multiple-bandwidth or multi-spectrum applications. Under the premise of not shrinking the optical diaphragm of the lens group, our achromatic doublet lenses ensure more concentrated light spots and clearer images. Regarding our stocked achromatic doublet lens, Shalom EO holds about 200 kinds of Positive Achromatic Doublet Lenses and 15 kinds of Negative Achromatic Doublet Lenses in stock, the diameters in general are standardized inches compliant for installation. The crown glass and flint glass substrate materials which compose our achromatic lens parts are all sourced from SCHOTT (e.g. BAFN10/SFL6, LAKN22/SFL6, BK7/SF2, BK7/SF5, etc.), securing the qualities of lenses through building a reliable channel to procure ingredients. At the current time, we offer three kinds of standard broadband anti-reflection coating, spanning from the visible to the infrared spectrum: 350-650nm, 650-1050 nm, and 1050-1580nm AR coating. Other custom coatings with designated wavelength ranges can also be tailored to your requirements.

Shalom EO also provide a series of custom achromatic lens including positive achromatic doublet, negative achromatic doublet, achromatic triplet lens, and aspheric achromatic lens. Our achromatic lenses are made from Flint glass (e.g CDGM H-ZFLA, SHOTT N-SF5, etc.) and Crown Glass (e.g. CDGM H-ZBAF52, SCHOTT N-BK7, etc.), and we accept the designation of certain glass codes from our clients. Custom coating options include uncoated substrates, BBAR coatings, V-coating, and low-cost MgF2 AR coatings. The accessible diameters span from 1.0mm to 300mm. For high-precision visible uses, we recommend our aspheric achromatic lens, manufactured using the single point diamond turning (SPDT) technique that combines the advantage of ultra-low spherical aberration exploiting its aspherical front profile.

Specifications:

Type	Achromatic Doublet Lens	Material	SCHOTT Crown Glass and Flint Glass (e.g. BAFN10/SFL6, LAKN22/SFL6, BK7/SF2, BK7/SF5)
Clear Aperture	>90%	Focal Length Tolerance	±1%
Coating	A: 350-650nm AR Coating; B: 650-1050nm AR Coating; C: 1050-1580nm AR Coating	Diameter Tolerance	+0.0/-0.1mm
Thickness Tolerance	±0.2mm	Centration	<3 arcmin
Irregularity	λ/4-λ@632.8nm	Surface Quality	60/40 S/D
Design Wavelength	A: 486.1nm, 587.6nm, 656.3nm B: 706.5nm, 855nm, 1015nm C: 1016nm, 1330nm, 1550nm		

Product List of Achromatic Doublet Lens

Code	Material (SCHOTT)	Diameter	CT	ET	Focal Length	Coating	BFL	Price
1113-001	BAK4 SF5	25.40mm	6.0mm	7.7mm	-100mm	350-650nm AR Coating	-103.6mm	Inquire
1113-002	BAFN10 SFL6	25.40mm	5.4mm	6.9mm	-100mm	350-650nm AR Coating	-103.9mm	Inquire

Product List of Achromatic Doublet Lens

Code	Material (SCHOTT)	Diameter	CT	ET	Focal Length	Coating	BFL	Price
1113-003	BAK4 SF5	25.40mm	6.3mm	8.6mm	-75mm	350-650nm AR Coating	-78.8mm	Inquire
1113-004	BAFN10 SFL6	25.40mm	5.8mm	7.9mm	-75mm	350-650nm AR Coating	-78.9mm	Inquire
1113-005	BAK4 SF5	12.70mm	3.7mm	4.6mm	-50mm	650-1050nm AR Coating	-52.3mm	Inquire
1113-006	BAFN10 SFL6	12.70mm	3.5mm	4.3mm	-50mm	650-1050nm AR Coating	-52.5mm	Inquire
1113-007	BAFN10 SF11	25.40mm	7.0mm	10.6mm	-40mm	350-650nm AR Coating	-43.6mm	Inquire
1113-008	BAFN10 SFL6	25.40mm	6.0mm	9.8mm	-40mm	350-650nm AR Coating	-43.4mm	Inquire
1113-009	BAFN10 SFL6	12.70mm	4.0mm	5.4mm	-25mm	350-650nm AR Coating	-27.0mm	Inquire
1113-010	BAFN10 SFL6	12.70mm	4.0mm	5.4mm	-25mm	650-1050nm AR Coating	-27.0mm	Inquire
1113-011	BAFN10 SFL6	12.70mm	4.3mm	5.9mm	-25mm	350-650nm AR Coating	-27.7mm	Inquire
1113-012	BAFN10 SFL6	12.70mm	4.3mm	5.9mm	-25mm	650-1050nm AR Coating	-27.7mm	Inquire
1113-013	BAFN10 SFL6	12.70mm	4.5mm	6.3mm	-20mm	350-650nm AR Coating	-22.3mm	Inquire
1113-014	BAFN10 SFL6	12.70mm	4.5mm	6.4mm	-20mm	350-650nm AR Coating	-22.5mm	Inquire
1113-015	BAFN10 SFL6	5.00mm	4.6mm	3.8mm	7.5mm	650-1050nm AR Coating	4.8mm	Inquire
1113-016	LAKN22 SFL6	5.00mm	4.0mm	3.1mm	7.5mm	650-1050nm AR Coating	5.2mm	Inquire
1113-017	BAK4 SF5	6.00mm	4.0mm	3.0mm	10mm	350-650nm AR Coating	7.9mm	Inquire
1113-018	BAK4 SF5	6.00mm	4.0mm	3.0mm	10mm	650-1050nm AR Coating	7.9mm	Inquire
1113-019	LAKN22 SFL6	6.00mm	4.0mm	2.3mm	10mm	350-650nm AR Coating	8.1mm	Inquire
1113-020	LAKN22 SFL6	6.00mm	4.0mm	2.3mm	10mm	650-1050nm AR Coating	8.1mm	Inquire
1113-021	LAKN22 SFL6	6.00mm	4.8mm	3.9mm	10mm	350-650nm AR Coating	8.5mm	Inquire
1113-022	LAKN22 SFL6	6.00mm	4.8mm	3.9mm	10mm	650-1050nm AR Coating	8.5mm	Inquire
1113-023	BAFN10 SFL6	8.00mm	6.5mm	4.9mm	10mm	650-1050nm AR Coating	6.7mm	Inquire
1113-024	LAK10 SFL6	8.00mm	5.8mm	4.4mm	10mm	650-1050nm AR Coating	7.0mm	Inquire
1113-025	BAFN10 SFL6	8.00mm	5.5mm	3.9mm	10mm	650-1050nm AR Coating	7.1mm	Inquire
1113-026	BAK4 SF5	6.35mm	4.0mm	3.1mm	12.7mm	650-1050nm AR Coating	10.3mm	Inquire
1113-027	BAK4 SF5	6.35mm	4.0mm	3.1mm	12.7mm	1050-1580nm AR Coating	10.3mm	Inquire
1113-028	LAKN22 SFL6	6.35mm	3.9mm	3.1mm	12.7mm	650-1050nm AR Coating	10.7mm	Inquire
1113-029	LAKN22 SFL6	6.35mm	3.9mm	3.1mm	12.7mm	1050-1580nm AR Coating	10.7mm	Inquire
1113-030	LAKN22 SFL6	6.35mm	4.1mm	3.3mm	12.7mm	650-1050nm AR Coating	11.4mm	Inquire
1113-031	LAKN22 SFL6	6.35mm	4.1mm	3.3mm	12.7mm	1050-1580nm AR Coating	11.4mm	Inquire
1113-032	BK7 SF2	5.00mm	4.8mm	4.3mm	15mm	350-650nm AR Coating	13.6mm	Inquire
1113-033	BK7 SF2	5.00mm	4.8mm	4.3mm	15mm	650-1050nm AR Coating	13.6mm	Inquire
1113-034	BK7 SF2	5.00mm	4.8mm	4.3mm	15mm	1050-1580nm AR Coating	13.6mm	Inquire
1113-035	LAKN22 SFL6	5.00mm	4.0mm	3.6mm	15mm	350-650nm AR Coating	13.0mm	Inquire
1113-036	LAKN22 SFL6	5.00mm	4.0mm	3.6mm	15mm	650-1050nm AR Coating	13.0mm	Inquire
1113-037	LAKN22 SFL6	5.00mm	4.0mm	3.6mm	15mm	1050-1580nm AR Coating	13.0mm	Inquire
1113-038	BAFN10 SFL6	5.00mm	3.3mm	2.9mm	15mm	350-650nm AR Coating	11.6mm	Inquire
1113-039	BAFN10 SFL6	5.00mm	3.3mm	2.9mm	15mm	650-1050nm AR Coating	11.6mm	Inquire
1113-040	BAFN10 SFL6	5.00mm	3.3mm	2.9mm	15mm	1050-1580nm AR Coating	11.6mm	Inquire
1113-041	BK7 SF2	6.35mm	4.0mm	3.2mm	15mm	650-1050nm AR Coating	13.0mm	Inquire
1113-042	BK7 SF2	6.35mm	4.0mm	3.2mm	15mm	1050-1580nm AR Coating	13.0mm	Inquire
1113-043	LAKN22 SFL6	6.35mm	3.9mm	3.2mm	15mm	650-1050nm AR Coating	13.1mm	Inquire
1113-044	LAKN22 SFL6	6.35mm	3.9mm	3.2mm	15mm	1050-1580nm AR Coating	13.1mm	Inquire
1113-045	LAKN22 SFL6	6.35mm	3.6mm	2.9mm	15mm	650-1050nm AR Coating	14.4mm	Inquire
1113-046	LAKN22 SFL6	6.35mm	3.6mm	2.9mm	15mm	1050-1580nm AR Coating	14.4mm	Inquire
1113-047	BK7 SF2	8.00mm	4.0mm	3.0mm	20mm	350-650nm AR Coating	17.8mm	Inquire
1113-048	BK7 SF2	8.00mm	4.0mm	3.0mm	20mm	650-1050nm AR Coating	17.8mm	Inquire
1113-049	LAKN22 SFL6	8.00mm	3.6mm	2.8mm	20mm	350-650nm AR Coating	18.2mm	Inquire
1113-050	LAKN22 SFL6	8.00mm	3.6mm	2.8mm	20mm	650-1050nm AR Coating	18.2mm	Inquire
1113-051	LAKN22 SFL6	8.00mm	4.6mm	3.7mm	20mm	350-650nm AR Coating	15.7mm	Inquire
1113-052	LAKN22 SFL6	8.00mm	4.6mm	3.7mm	20mm	650-1050nm AR Coating	15.7mm	Inquire
1113-053	BAFN10 SF10	12.70mm	7.0mm	5.6mm	25mm	650-1050nm AR Coating	21.5mm	Inquire
1113-054	LAKN22 SFL6	12.70mm	7.0mm	5.4mm	25mm	650-1050nm AR Coating	21.1mm	Inquire
1113-055	LAKN22 SFL6	12.70mm	6.2mm	4.5mm	25mm	650-1050nm AR Coating	20.3mm	Inquire
1113-056	BAFN10 SFL6	25.40mm	14.0mm	8.8mm	30mm	650-1050nm AR Coating	22.9mm	Inquire
1113-057	BAFN10 SFL6	25.40mm	14.0mm	8.8mm	30mm	1050-1580nm AR Coating	22.9mm	Inquire
1113-058	BAFN10 SFL6	25.40mm	13.5mm	8.2mm	30mm	650-1050nm AR Coating	23.0mm	Inquire
1113-059	BAFN10 SFL6	25.40mm	13.5mm	8.2mm	30mm	1050-1580nm AR Coating	23.0mm	Inquire
1113-060	BAFN10 SFL6	25.40mm	14.8mm	9.4mm	30mm	650-1050nm AR Coating	22.2mm	Inquire
1113-061	BAFN10 SFL6	25.40mm	14.8mm	9.4mm	30mm	1050-1580nm AR Coating	22.2mm	Inquire
1113-062	BAFN10 SFL6	25.40mm	14.0mm	9.6mm	35mm	650-1050nm AR Coating	27.3mm	Inquire

Product List of Achromatic Doublet Lens

Code	Material (SCHOTT)	Diameter	CT	ET	Focal Length	Coating	BFL	Price
1113-063	BAFN10 SFL6	25.40mm	12.0mm	7.5mm	35mm	650-1050nm AR Coating	28.4mm	Inquire
1113-064	BAFN10 SFL6	25.40mm	13.3mm	8.7mm	35mm	650-1050nm AR Coating	27.4mm	Inquire
1113-065	BK7 SF5	25.40mm	12.5mm	7.4mm	40mm	650-1050nm AR Coating	33.4mm	Inquire
1113-066	BAFN10 SFL6	25.40mm	12.5mm	8.6mm	40mm	650-1050nm AR Coating	32.8mm	Inquire
1113-067	LAKN22 SFL6	25.40mm	11.8mm	7.7mm	40mm	650-1050nm AR Coating	32.8mm	Inquire
1113-068	BAFN10 SFL6	25.40mm	9.0mm	5.7mm	45mm	1050-1580nm AR Coating	40.2mm	Inquire
1113-069	LAKN22 SFL6	25.40mm	9.4mm	5.9mm	45mm	1050-1580nm AR Coating	39.6mm	Inquire
1113-070	LAKN22 SFL6	25.40mm	11.4mm	7.7mm	45mm	1050-1580nm AR Coating	36.7mm	Inquire
1113-071	BK7 SF2	12.70mm	5.0mm	4.0mm	50mm	350-650nm AR Coating	47.2mm	Inquire
1113-072	BK7 SF2	12.70mm	5.0mm	4.0mm	50mm	650-1050nm AR Coating	47.2mm	Inquire
1113-073	BAFN10 SFL6	12.70mm	5.0mm	4.2mm	50mm	350-650nm AR Coating	46.2mm	Inquire
1113-074	BAFN10 SFL6	12.70mm	5.0mm	4.2mm	50mm	650-1050nm AR Coating	46.2mm	Inquire
1113-075	BAFN10 SFL6	12.70mm	5.5mm	4.6mm	50mm	350-650nm AR Coating	43.5mm	Inquire
1113-076	BAFN10 SFL6	12.70mm	5.5mm	4.6mm	50mm	650-1050nm AR Coating	43.5mm	Inquire
1113-077	BAFN10 SF10	25.40mm	11.5mm	8.7mm	50mm	350-650nm AR Coating	43.4mm	Inquire
1113-078	BAFN10 SF10	25.40mm	11.5mm	8.7mm	50mm	650-1050nm AR Coating	43.4mm	Inquire
1113-079	LAKN22 SFL6	25.40mm	9.3mm	6.2mm	50mm	350-650nm AR Coating	45.0mm	Inquire
1113-080	LAKN22 SFL6	25.40mm	9.3mm	6.2mm	50mm	650-1050nm AR Coating	45.0mm	Inquire
1113-081	LAKN22 SFL6	25.40mm	10.8mm	7.4mm	50mm	350-650nm AR Coating	41.2mm	Inquire
1113-082	LAKN22 SFL6	25.40mm	10.8mm	7.4mm	50mm	650-1050nm AR Coating	41.2mm	Inquire
1113-083	BAFN10 SFL6	30.00mm	10.5mm	6.3mm	50mm	1050-1580nm AR Coating	44.3mm	Inquire
1113-084	BAFN10 SFL6	30.00mm	11.5mm	7.2mm	50mm	1050-1580nm AR Coating	42.9mm	Inquire
1113-085	BAFN10 SFL6	30.00mm	12.0mm	7.7mm	50mm	1050-1580nm AR Coating	44.7mm	Inquire
1113-086	BAF11 SF10	25.40mm	10.5mm	8.2mm	60mm	650-1050nm AR Coating	54.3mm	Inquire
1113-087	LAKN22 SFL6	25.40mm	7.7mm	5.1mm	60mm	650-1050nm AR Coating	55.8mm	Inquire
1113-088	LAKN22 SFL6	25.40mm	10.1mm	7.2mm	60mm	650-1050nm AR Coating	50.5mm	Inquire
1113-089	BK7 SF2	12.70mm	4.0mm	3.4mm	75mm	350-650nm AR Coating	72.9mm	Inquire
1113-090	BK7 SF2	12.70mm	4.0mm	3.4mm	75mm	650-1050nm AR Coating	72.9mm	Inquire
1113-091	BAFN10 SFL6	12.70mm	4.0mm	3.5mm	75mm	350-650nm AR Coating	72.0mm	Inquire
1113-092	BAFN10 SFL6	12.70mm	4.0mm	3.5mm	75mm	650-1050nm AR Coating	72.0mm	Inquire
1113-093	BAFN10 SFL6	12.70mm	4.5mm	3.9mm	75mm	350-650nm AR Coating	69.7mm	Inquire
1113-094	BAFN10 SFL6	12.70mm	4.5mm	3.9mm	75mm	650-1050nm AR Coating	69.7mm	Inquire
1113-095	BK7 SF5	25.40mm	9.5mm	6.9mm	75mm	350-650nm AR Coating	70.3mm	Inquire
1113-096	BK7 SF5	25.40mm	9.5mm	6.9mm	75mm	650-1050nm AR Coating	70.3mm	Inquire
1113-097	BAFN10 SFL6	25.40mm	6.6mm	4.5mm	75mm	350-650nm AR Coating	69.9mm	Inquire
1113-098	BAFN10 SFL6	25.40mm	6.6mm	4.5mm	75mm	650-1050nm AR Coating	69.9mm	Inquire
1113-099	BAFN10 SFL6	25.40mm	9.4mm	7.1mm	75mm	350-650nm AR Coating	64.9mm	Inquire
1113-100	BAFN10 SFL6	25.40mm	9.4mm	7.1mm	75mm	650-1050nm AR Coating	64.9mm	Inquire
1113-101	BAFN10 SFL6	30.00mm	10.5mm	7.9mm	80mm	350-650nm AR Coating	74.3mm	Inquire
1113-102	LAKN22 SFL6	30.00mm	8.5mm	5.8mm	80mm	350-650nm AR Coating	75.3mm	Inquire
1113-103	BAFN10 SFL6	30.00mm	11.5mm	8.5mm	80mm	350-650nm AR Coating	68.4mm	Inquire
1113-104	BAFN10 SFL6	50.80mm	18.0mm	10.5mm	80mm	1050-1580nm AR Coating	69.9mm	Inquire
1113-105	BAFN10 SFL6	50.80mm	18.0mm	10.3mm	80mm	1050-1580nm AR Coating	69.5mm	Inquire
1113-106	BAFN10 SFL6	50.80mm	20.5mm	12.6mm	80mm	1050-1580nm AR Coating	66.9mm	Inquire
1113-107	BK7 SF5	25.40mm	6.5mm	4.7mm	100mm	350-650nm AR Coating	97.1mm	Inquire
1113-108	BK7 SF5	25.40mm	6.5mm	4.7mm	100mm	650-1050nm AR Coating	97.1mm	Inquire
1113-109	LAKN22 SFL6	25.40mm	5.5mm	4.0mm	100mm	350-650nm AR Coating	97.1mm	Inquire
1113-110	LAKN22 SFL6	25.40mm	5.5mm	4.0mm	100mm	650-1050nm AR Coating	97.1mm	Inquire
1113-111	BAFN10 SFL6	25.40mm	8.3mm	6.6mm	100mm	350-650nm AR Coating	90.3mm	Inquire
1113-112	BAFN10 SFL6	25.40mm	8.3mm	6.6mm	100mm	650-1050nm AR Coating	90.3mm	Inquire
1113-113	BAFN10 SFL6	30.00mm	7.0mm	5.0mm	100mm	1050-1580nm AR Coating	96.4mm	Inquire
1113-114	BAFN10 SFL6	30.00mm	8.0mm	5.9mm	100mm	1050-1580nm AR Coating	94.0mm	Inquire
1113-115	BAFN10 SFL6	30.00mm	10.7mm	8.3mm	100mm	1050-1580nm AR Coating	88.0mm	Inquire
1113-116	BK7 SF5	25.40mm	7.9mm	6.6mm	150mm	350-650nm AR Coating	146.1mm	Inquire
1113-117	BK7 SF5	25.40mm	7.9mm	6.6mm	150mm	650-1050nm AR Coating	146.1mm	Inquire
1113-118	LAKN22 SFL6	25.40mm	7.5mm	6.5mm	150mm	350-650nm AR Coating	144.6mm	Inquire
1113-119	LAKN22 SFL6	25.40mm	7.5mm	6.5mm	150mm	650-1050nm AR Coating	144.6mm	Inquire
1113-120	BAFN10 SFL6	25.40mm	7.5mm	6.3mm	150mm	350-650nm AR Coating	140.6mm	Inquire
1113-121	BAFN10 SFL6	25.40mm	7.5mm	6.3mm	150mm	650-1050nm AR Coating	140.6mm	Inquire
1113-122	SSKN5 LAFN7	25.40mm	6.5mm	5.7mm	200mm	650-1050nm AR Coating	194.0mm	Inquire

Product List of Achromatic Doublet Lens

Code	Material (SCHOTT)	Diameter	CT	ET	Focal Length	Coating	BFL	Price
1113-123	LAKN22 SF10	25.40mm	8.0mm	7.3mm	200mm	650-1050nm AR Coating	194.8mm	Inquire
1113-124	LAKN22 SFL6	25.40mm	7.0mm	6.1mm	200mm	650-1050nm AR Coating	193.1mm	Inquire
1113-125	BK7 SF2	50.80mm	10.5mm	6.7mm	200mm	650-1050nm AR Coating	193.7mm	Inquire
1113-126	LAKN22 SFL6	50.80mm	13.2mm	10.1mm	200mm	650-1050nm AR Coating	193.2mm	Inquire
1113-127	LAKN22 SFL6	50.80mm	15.0mm	11.4mm	200mm	650-1050nm AR Coating	182.7mm	Inquire
1113-128	BK7 SF2	25.40mm	6.0mm	5.2mm	250mm	350-650nm AR Coating	246.7mm	Inquire
1113-129	BK7 SF2	25.40mm	6.0mm	5.2mm	250mm	650-1050nm AR Coating	246.7mm	Inquire
1113-130	SF5 SFL6	25.40mm	5.5mm	4.7mm	250mm	350-650nm AR Coating	237.5mm	Inquire
1113-131	SF5 SFL6	25.40mm	5.5mm	4.7mm	250mm	650-1050nm AR Coating	237.5mm	Inquire
1113-132	SF2 SFL6	25.40mm	7.0mm	6.0mm	250mm	350-650nm AR Coating	235.3mm	Inquire
1113-133	SF2 SFL6	25.40mm	7.0mm	6.0mm	250mm	650-1050nm AR Coating	235.3mm	Inquire
1113-134	BK7 SF2	25.40mm	6.0mm	5.4mm	300mm	350-650nm AR Coating	297.0mm	Inquire
1113-135	BK7 SF2	25.40mm	6.0mm	5.4mm	300mm	650-1050nm AR Coating	297.0mm	Inquire
1113-136	SF5 SFL6	25.40mm	6.0mm	5.3mm	300mm	350-650nm AR Coating	290.0mm	Inquire
1113-137	SF5 SFL6	25.40mm	6.0mm	5.3mm	300mm	650-1050nm AR Coating	290.0mm	Inquire
1113-138	SF2 SFL6	25.40mm	7.0mm	6.2mm	300mm	350-650nm AR Coating	285.9mm	Inquire
1113-139	SF2 SFL6	25.40mm	7.0mm	6.2mm	300mm	650-1050nm AR Coating	285.9mm	Inquire
1113-140	BK7 SF2	50.80mm	8.0mm	5.4mm	300mm	350-650nm AR Coating	295.4mm	Inquire
1113-141	BK7 SF2	50.80mm	8.0mm	5.4mm	300mm	1050-1580nm AR Coating	295.4mm	Inquire
1113-142	LAKN22 SFL6	50.80mm	9.2mm	7.2mm	300mm	350-650nm AR Coating	295.1mm	Inquire
1113-143	LAKN22 SFL6	50.80mm	9.2mm	7.2mm	300mm	1050-1580nm AR Coating	295.1mm	Inquire
1113-144	BAFN10 SFL6	50.80mm	11.5mm	9.1mm	300mm	350-650nm AR Coating	287.4mm	Inquire
1113-145	BAFN10 SFL6	50.80mm	11.5mm	9.1mm	300mm	1050-1580nm AR Coating	287.4mm	Inquire
1113-146	BK7 SF2	25.40mm	6.0mm	5.5mm	400mm	350-650nm AR Coating	396.0mm	Inquire
1113-147	BK7 SF2	25.40mm	6.0mm	5.5mm	400mm	650-1050nm AR Coating	396.0mm	Inquire
1113-148	BK7 SF2	25.40mm	6.0mm	5.5mm	400mm	1050-1580nm AR Coating	396.0mm	Inquire
1113-149	SF5 SFL6	25.40mm	5.3mm	4.8mm	400mm	350-650nm AR Coating	391.1mm	Inquire
1113-150	SF5 SFL6	25.40mm	5.3mm	4.8mm	400mm	650-1050nm AR Coating	391.1mm	Inquire
1113-151	SF5 SFL6	25.40mm	5.3mm	4.8mm	400mm	1050-1580nm AR Coating	391.1mm	Inquire
1113-152	SF2 SFL6	25.40mm	6.7mm	6.1mm	400mm	350-650nm AR Coating	386.8mm	Inquire
1113-153	SF2 SFL6	25.40mm	6.7mm	6.1mm	400mm	650-1050nm AR Coating	386.8mm	Inquire
1113-154	SF2 SFL6	25.40mm	6.7mm	6.1mm	400mm	1050-1580nm AR Coating	386.8mm	Inquire
1113-155	BK7 SF2	50.80mm	7.0mm	5.1mm	400mm	350-650nm AR Coating	396.1mm	Inquire
1113-156	BK7 SF2	50.80mm	7.0mm	5.1mm	400mm	650-1050nm AR Coating	396.1mm	Inquire
1113-157	LAKN22 SFL6	50.80mm	7.1mm	5.6mm	400mm	350-650nm AR Coating	393.6mm	Inquire
1113-158	LAKN22 SFL6	50.80mm	7.1mm	5.6mm	400mm	650-1050nm AR Coating	393.6mm	Inquire
1113-159	BAFN10 SFL6	50.80mm	9.5mm	7.8mm	400mm	350-650nm AR Coating	391.1mm	Inquire
1113-160	BAFN10 SFL6	50.80mm	9.5mm	7.8mm	400mm	650-1050nm AR Coating	391.1mm	Inquire
1113-161	BK7 SF2	25.40mm	6.0mm	5.6mm	500mm	350-650nm AR Coating	499.9mm	Inquire
1113-162	BK7 SF2	25.40mm	6.0mm	5.6mm	500mm	650-1050nm AR Coating	499.9mm	Inquire
1113-163	SF10 SFL6	25.40mm	6.0mm	5.6mm	500mm	350-650nm AR Coating	480.8mm	Inquire
1113-164	SF10 SFL6	25.40mm	6.0mm	5.6mm	500mm	650-1050nm AR Coating	480.8mm	Inquire
1113-165	SF2 SFL6	25.40mm	5.5mm	5.0mm	500mm	350-650nm AR Coating	486.9mm	Inquire
1113-166	SF2 SFL6	25.40mm	5.5mm	5.0mm	500mm	650-1050nm AR Coating	486.9mm	Inquire
1113-167	BK7 SF2	50.80mm	7.0mm	5.5mm	500mm	350-650nm AR Coating	495.8mm	Inquire
1113-168	BK7 SF2	50.80mm	7.0mm	5.5mm	500mm	1050-1580nm AR Coating	495.8mm	Inquire
1113-169	LAKN22 SFL6	50.80mm	7.1mm	5.9mm	500mm	350-650nm AR Coating	497.0mm	Inquire
1113-170	LAKN22 SFL6	50.80mm	7.1mm	5.9mm	500mm	1050-1580nm AR Coating	497.0mm	Inquire
1113-171	SF5 SFL6	50.80mm	11.8mm	9.9mm	500mm	350-650nm AR Coating	474.4mm	Inquire
1113-172	SF5 SFL6	50.80mm	11.8mm	9.9mm	500mm	1050-1580nm AR Coating	474.4mm	Inquire
1113-173	BK7 SF2	50.80mm	6.5mm	5.5mm	750mm	350-650nm AR Coating	746.5mm	Inquire
1113-174	BK7 SF2	50.80mm	6.5mm	5.5mm	750mm	1050-1580nm AR Coating	746.5mm	Inquire
1113-175	BAFN10 SF10	50.80mm	6.7mm	6.0mm	750mm	350-650nm AR Coating	744.8mm	Inquire
1113-176	BAFN10 SF10	50.80mm	6.7mm	6.0mm	750mm	1050-1580nm AR Coating	744.8mm	Inquire
1113-177	SF10 SFL6	50.80mm	11.8mm	10.7mm	750mm	350-650nm AR Coating	711.0mm	Inquire
1113-178	SF10 SFL6	50.80mm	11.8mm	10.7mm	750mm	1050-1580nm AR Coating	711.0mm	Inquire
1113-179	BK7 SF2	50.80mm	6.0mm	5.2mm	1000mm	1050-1580nm AR Coating	994.6mm	Inquire
1113-180	BAFN10 SF10	50.80mm	7.0mm	6.4mm	1000mm	1050-1580nm AR Coating	993.4mm	Inquire

Meniscus Lenses



- Broad diameter range: 1.0mm to 300mm
- Substrate materials: Fused Silica, N-BK7, Chalcogenide glass, BaF2, CaF2, MgF2, Germanium, ZnSe, GaAs, Sapphire, etc.
- Standardized focal lengths and diameters convenient for OEM
- Coating options: uncoated, MgF2 single layer AR coating, laser line V-coating and BBAR coating

A Meniscus Lens, or a Convex-concave Lens is an optical lens consisting of one concave and one convex side, and the two sides have different radii of curvature according which the meniscus lenses could be categorized into two kinds: positive meniscus lenses and negative meniscus lenses.

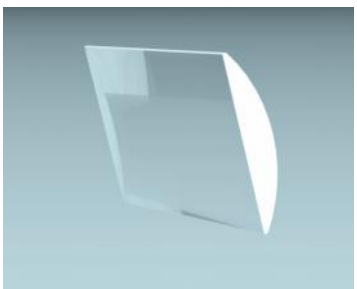
A Positive Meniscus Lens is more curved on the convex side than on the concave side, and its edge thickness is greater than its central thickness, contributing to a positive focal length. In contrast, a Negative Meniscus Lens is more curved on the concave side than on the convex side, and its central thickness is greater than its edge thickness, contributing to a negative focal length. Positive Meniscus Lenses converge light is utilized to reduce the focal length when used in conjunction with other lenses and increase the numerical aperture (NA) of existing optical modules without introducing significant spherical aberration. These functions are quite useful for image instruments to increase the resolution, and for focusing lasers to shrink the spot diameter when the incident beam width is rather large, providing diffraction-limited performance and better precision for laser processing. A negative meniscus lens diverges light and functions in just the opposite manner as a positive meniscus lens, to increase the focal length, reduce the NA of the optical assemblies, and expand beams.

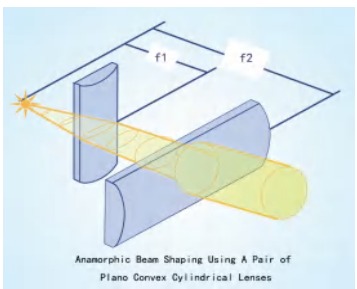
Hangzhou Shalom EO offers Custom Positive and Negative Meniscus Lenses made from a wide assortment of materials, including Fused Silica, N-BK7, Chalcogenide Glass, Germanium, GaAs, ZnSe, Baf2/CaF2/MgF2, Sapphire, etc. Diameters from 1.0mm to 300mm are available. Custom coating options include uncoated substrates, Broadband Anti-reflection (BBAR) coatings that cut to a significant extent the reflection (average reflection below 0.5%) over a certain wavelength range, and V-coating which provides higher transmission (average reflection below 0.25%) at a narrower range, and low-cost MgF2 AR coatings (average reflection below 1.5%). The different transmission wavelength ranges of the coatings could be selected according to your requirements. While other specifications could all be tailored for you.

Specifications:

Lens Form	Positive/Negative meniscus Lens	Material	BK7, Fused Silica, CaF2, BaF2, MgF2, ZnSe, GaAs, Ge, Sapphire, Etc.
Diameter Range	1mm -300mm	Diameter Tolerance	+0.0/-0.1mm
Clear Aperture	>90%	Thickness Tolerance	±0.1mm
Focal Length Tolerance	±2%	Surface Quality	40/20 S/D
Irregularity	λ/4 @ 633 nm (λ/8 optional)	Centering	2 arc min

Plano-Convex Cylindrical Lens





- Substrate materials: Fine Annealed N-BK7
- Ideal for one-dimensional condensation of images, laser line generation, and diode laser beam shaping
- Various focal lengths (4mm to 1000mm) and a large selection of dimensions
- Standard coating options: 350-650nm, 650-1050 nm, 1050-1580 nm, or uncoated, custom bandwidths
- Custom Plano Concave Cylindrical Lenses made from Fused Silica, CaF2, BaF2, MgF2, ZnSe, etc. are also available
- Applications: Laser scanners, diode lasers, optical metrologies, spectroscopes, etc.

A Plano Convex Cylindrical Lens is, in essence, a transparent cylinder with one flat surface and one extruding curved surface, which contributes to a positive focal length. The fundamental function of the plano-convex cylindrical lens is to condense a matrix of laser beams, when the matrix of laser beams needs to be focused inside a detector, the PCX cylindrical lens compresses the matrix into a single line. This trait also helps plano-convex cylindrical lenses to modulate the aspect ratio of the image. Just like its plate plano-convex lens cousin, a plano-convex cylindrical lens performs best at infinite absolute conjugate ratios, and becomes disadvantageous when the conjugate ratios are below 5:1. What discriminates a plate PCX and a cylindrical PCX are that the former diverges lights in two dimensions, the later expands light beam in one.

The prior nature of Plano-convex cylindrical lenses, which is making a two-dimensional light beam becomes a linear laser line, can be leveraged in diverse applications like the coupling of a slit input of laser diodes, changing the aspect ratio of an image, laser scanners, dye lasers, spectroscopies, and receivers of energies in linear detectors. A plano-convex lens can either modulate the aspect ratio of an image or create a line image from the point light beam source. A PCX cylindrical lens is also often hired to collect collimated light beams to generate a thin line.

Another crucial application of the Plano-convex cylindrical lens is anamorphic beam shaping, which just refers to correcting the elliptical-shaped laser beam generated from a laser diode into a circular-shaped one. The elliptical laser beam is the product of a rectangular Fresnel aperture and is undesirable because this implies a larger beam area which wastes more power, fewer homogeneities, and a terrible Gaussian Beam Profile. A pair of Plano-convex cylindrical lenses could be used to circularize the elliptical beams. During the test, a pair of plano-convex cylindrical lenses are positioned so that lenses are orthogonal as shown in the figure. From the result, we can conclude that using a pair of plano-convex cylindrical lenses to circularize the elliptical beam is a high-transmission, balance-shape, astigmatism-attenuated approach.

N-BK7 or its equivalent known as H-K9L is a ROHS-compliant borosilicate crown glass with superior optical excellence and the glass is fine annealed and polished to tight tolerances to meet the demanding tolerances. The most attractive advantages of N-BK7 are its high optical homogeneities and high transmission to VIS and NIR spectra. Besides, the hardness, chemical and thermal resilience of N-BK7 are also remarkable, it contains low levels of inclusions and bubbles, therefore N-BK7 is excellent for making high-precision optical lenses.

Hangzhou Shalom EO offers stocked N-BK7 Plano-Convex Cylindrical Lenses. The various focal lengths range from 4mm to 1000mm, while the dimensions also come in large selections to accommodate your requirements. Standard coating options include 350-650nm, 650-1050 nm, and 1050-1580nm anti-reflection coatings to elevate the transmission of the lens substrate, while uncoated and custom coating bandwidths could all be tailored through inquiries. With unceasing devotion and engineering intelligence, Shalom EO has earned credits among researchers and clients around the globe. Before shipment, the cylindrical lenses will undergo a stringent in-house inspection in our clean room using Zygo interferometers and other equipment to secure your interest.

Besides the off-the-shelf PCV cylindrical lens made from N-BK7, we also provide custom Plano-convex cylindrical lenses made from a wide portfolio of other materials including Fused Silica, CaF2, BaF2, MgF2, ZnSe, etc. With BBAR coatings, V-coatings, and cheaper MgF2 AR coatings.

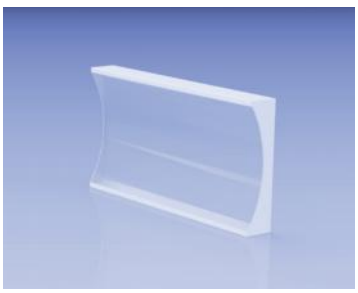
Specifications:

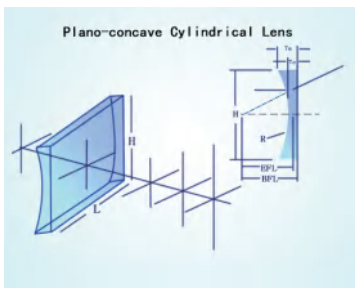
Type	Plano-Convex Cylindrical Lenses	Material	N-BK7
Clear Aperture	>90%	Size Tolerance	+0/-0.1mm
Thickness Tolerance	±0.2mm	Surface Irregularity	λ/4-λ@633nm
Surface Quality	60/20 S/D	Paraxial Focal Length	±2% @587.6nm
Chamfer	0.2mm x 45 degree	Centering Error	<3 arcmin

Product List of Plano-Convex Cylindrical Lens

Code	Material	Size	CT	ET	Focal Length	Coating	Curvature Radius	BFL	Price
1111-001	N-BK7	8mm(L)x4mm(H)	3.56mm	2mm	4	650-1050nm AR Coating	2.07mm	1.65mm	$24.50
1111-002	N-BK7	6mm(L)x4mm(H)	2.76mm	2mm	5.8	Uncoated	3.00mm	3.98mm	$17.50
1111-003	N-BK7	6mm(L)x4mm(H)	2.76mm	2mm	5.8	350-650nm AR Coating	3.00mm	3.98mm	$24.50
1111-004	N-BK7	8mm(L)x4mm(H)	2.76mm	2mm	5.8	Uncoated	3.00mm	3.98mm	$17.50
1111-005	N-BK7	8mm(L)x6mm(H)	3.95mm	2mm	6.35	Uncoated	3.28mm	3.75mm	$17.50
1111-006	N-BK7	9mm(L)x7mm(H)	4.09mm	2mm	7.7	Uncoated	3.98mm	5.00mm	$17.50
1111-007	N-BK7	14mm(L)x7mm(H)	4.09mm	2mm	7.7	Uncoated	3.98mm	5.00mm	$17.50
1111-008	N-BK7	20mm(L)x10mm(H)	5.88mm	2mm	10	650-1050nm AR Coating	5.17mm	6.12mm	$33.50
1111-009	N-BK7	20mm(L)x10mm(H)	4.31mm	2mm	12.7	Uncoated	6.56mm	9.86mm	$24.50
1111-010	N-BK7	26mm(L)x13mm(H)	7.67mm	2mm	12.7	1050-1580nm AR Coating	6.56mm	7.64mm	$40.50
1111-011	N-BK7	15mm(L)x13mm(H)	6.27mm	2mm	13.7	1050-1580nm AR Coating	7.08mm	9.57mm	$35.00
1111-012	N-BK7	20mm(L)x10mm(H)	3.82mm	2mm	15	650-1050nm AR Coating	7.75mm	12.48mm	$33.50
1111-013	N-BK7	17mm(L)x15mm(H)	5.22mm	2mm	20	650-1050nm AR Coating	10.34mm	16.56mm	$33.50
1111-014	N-BK7	30mm(L)x15mm(H)	5.22mm	2mm	20	650-1050nm AR Coating	20.34mm	16.56mm	$38.50
1111-015	N-BK7	25mm(L)x12.5mm(H)	3.85mm	2mm	22.2	Uncoated	11.47mm	19.66mm	$28.00
1111-016	N-BK7	12mm(L)x10mm(H)	3mm	2mm	25	Uncoated	12.92mm	23.02mm	$17.50
1111-017	N-BK7	12mm(L)x10mm(H)	3mm	2mm	25	350-650nm AR Coating	12.92mm	23.02mm	$24.50
1111-018	N-BK7	12mm(L)x10mm(H)	3mm	2mm	25	650-1050nm AR Coating	12.92mm	23.02mm	$24.50
1111-019	N-BK7	20mm(L)x10mm(H)	3mm	2mm	25	Uncoated	12.92mm	23.02mm	$24.50
1111-020	N-BK7	20mm(L)x10mm(H)	3mm	2mm	25	350-650nm AR Coating	12.92mm	23.02mm	$33.50
1111-021	N-BK7	20mm(L)x10mm(H)	3mm	2mm	25	650-1050nm AR Coating	12.92mm	23.02mm	$33.50
1111-022	N-BK7	22mm(L)x20mm(H)	6.74mm	2mm	25	650-1050nm AR Coating	12.92mm	20.56mm	$38.50
1111-023	N-BK7	28mm(L)x25.4mm(H)	11.82mm	2mm	25.4	350-650nm AR Coating	13.13mm	17.61mm	$38.50
1111-024	N-BK7	51mm(L)x25.4mm(H)	6.64mm	2mm	38.1	Uncoated	19.69mm	33.72mm	$42.00
1111-025	N-BK7	12mm(L)x10mm(H)	2.61mm	2mm	40	Uncoated	20.67mm	38.28mm	$17.50
1111-026	N-BK7	12mm(L)x10mm(H)	2.61mm	2mm	40	350-650nm AR Coating	20.67mm	38.28mm	$24.50
1111-027	N-BK7	12mm(L)x10mm(H)	2.61mm	2mm	40	1050-1580nm AR Coating	20.67mm	38.28mm	$25.50
1111-028	N-BK7	20mm(L)x10mm(H)	2.61mm	2mm	40	Uncoated	20.67mm	38.28mm	$24.50
1111-029	N-BK7	20mm(L)x10mm(H)	2.61mm	2mm	40	350-650nm AR Coating	20.67mm	38.28mm	$33.50
1111-030	N-BK7	22mm(L)x20mm(H)	4.57mm	2mm	40	650-1050nm AR Coating	20.67mm	36.99mm	$38.50
1111-031	N-BK7	40mm(L)x20mm(H)	4.57mm	2mm	40	650-1050nm AR Coating	20.67mm	36.99mm	$57.50
1111-032	N-BK7	22mm(L)x20mm(H)	4.01mm	2mm	50	Uncoated	25.84mm	47.36mm	$28.00
1111-033	N-BK7	22mm(L)x20mm(H)	4.01mm	2mm	50	650-1050nm AR Coating	25.84mm	47.36mm	$38.50
1111-034	N-BK7	40mm(L)x20mm(H)	4.01mm	2mm	50	Uncoated	25.84mm	47.36mm	$42.00
1111-035	N-BK7	53mm(L)x50.8mm(H)	21.62mm	2mm	50.8	Uncoated	26.25mm	36.55mm	Inquire
1111-036	N-BK7	32mm(L)x30mm(H)	5.87mm	2mm	60	Uncoated	31.01mm	56.13mm	$28.00
1111-037	N-BK7	32mm(L)x30mm(H)	5.87mm	2mm	60	350-650nm AR Coating	31.01mm	56.13mm	$38.50
1111-038	N-BK7	60mm(L)x30mm(H)	5.87mm	2mm	60	1050-1580nm AR Coating	31.01mm	56.13mm	$61.00
1111-039	N-BK7	62mm(L)x60mm(H)	25.18mm	2mm	60	Uncoated	31.01mm	43.40mm	Inquire
1111-040	N-BK7	62mm(L)x60mm(H)	25.18mm	2mm	60	650-1050nm AR Coating	31.01mm	43.40mm	Inquire
1111-041	N-BK7	95mm(L)x60mm(H)	25.18mm	2mm	60	Uncoated	31.01mm	43.40mm	Inquire
1111-042	N-BK7	32mm(L)x30mm(H)	5.25mm	2mm	70	Uncoated	36.18mm	66.54mm	$28.00
1111-043	N-BK7	32mm(L)x30mm(H)	5.25mm	2mm	70	350-650nm AR Coating	36.18mm	66.54mm	$38.50
1111-044	N-BK7	32mm(L)x30mm(H)	5.25mm	2mm	70	1050-1580nm AR Coating	36.18mm	66.54mm	$40.50
1111-045	N-BK7	95mm(L)x50.8mm(H)	11.48mm	2mm	75	Uncoated	38.76mm	67.43mm	Inquire
1111-046	N-BK7	95mm(L)x50.8mm(H)	11.48mm	2mm	75	350-650nm AR Coating	38.76mm	67.43mm	Inquire
1111-047	N-BK7	51mm(L)x25.4mm(H)	5.12mm	3mm	75.6	Uncoated	39.07mm	72.22mm	$42.00
1111-048	N-BK7	51mm(L)x25.4mm(H)	5.12mm	3mm	75.6	650-1050nm AR Coating	39.07mm	72.22mm	$57.50
1111-049	N-BK7	95mm(L)x50.8mm(H)	12.38mm	3mm	75.6	350-650nm AR Coating	39.07mm	67.44mm	Inquire
1111-050	N-BK7	22mm(L)x20mm(H)	4.22mm	3mm	80	Uncoated	41.34mm	77.22mm	$28.00
1111-051	N-BK7	40mm(L)x20mm(H)	4.22mm	3mm	80	Uncoated	41.34mm	77.22mm	$42.00
1111-052	N-BK7	32mm(L)x30mm(H)	5.22mm	3mm	100	Uncoated	51.68mm	96.56mm	$28.00
1111-053	N-BK7	32mm(L)x30mm(H)	5.22mm	3mm	100	1050-1580nm AR Coating	51.68mm	96.56mm	$40.50
1111-054	N-BK7	60mm(L)x30mm(H)	5.22mm	3mm	100	Uncoated	51.68mm	96.56mm	$42.00
1111-055	N-BK7	60mm(L)x30mm(H)	5.22mm	3mm	100	650-1050nm AR Coating	51.68mm	96.56mm	$57.50
1111-056	N-BK7	60mm(L)x30mm(H)	5.22mm	3mm	100	1050-1580nm AR Coating	51.68mm	96.56mm	$61.00
1111-057	N-BK7	60mm(L)x30mm(H)	4.69mm	3mm	130	Uncoated	67.18mm	126.91mm	$42.00
1111-058	N-BK7	22mm(L)x20mm(H)	3.64mm	3mm	150	350-650nm AR Coating	77.52mm	147.60mm	$38.50
1111-059	N-BK7	40mm(L)x20mm(H)	3.64mm	3mm	150	Uncoated	77.52mm	147.60mm	$42.00
1111-060	N-BK7	40mm(L)x20mm(H)	3.64mm	3mm	150	650-1050nm AR Coating	77.52mm	147.60mm	$57.50
1111-061	N-BK7	90mm(L)x100mm(H)	21.28mm	3mm	150	Uncoated	77.52mm	135.97mm	Inquire
1111-062	N-BK7	90mm(L)x100mm(H)	21.28mm	3mm	150	1050-1580nm AR Coating	77.52mm	135.97mm	Inquire
1111-063	N-BK7	32mm(L)x30mm(H)	4.09mm	3mm	200	Uncoated	103.36mm	197.30mm	$28.00
1111-064	N-BK7	90mm(L)x100mm(H)	15.89mm	3mm	200	350-650nm AR Coating	103.36mm	189.52mm	Inquire
1111-065	N-BK7	22mm(L)x20mm(H)	3.38mm	3mm	250	Uncoated	129.20mm	247.77mm	$28.00
1111-066	N-BK7	22mm(L)x20mm(H)	3.38mm	3mm	250	1050-1580nm AR Coating	129.20mm	247.77mm	$40.50
1111-067	N-BK7	40mm(L)x20mm(H)	3.38mm	3mm	250	Uncoated	129.20mm	247.77mm	$42.00
1111-068	N-BK7	32mm(L)x30mm(H)	3.72mm	3mm	300	Uncoated	155.04mm	297.55mm	$28.00
1111-069	N-BK7	32mm(L)x30mm(H)	3.72mm	3mm	300	350-650nm AR Coating	155.04mm	297.55mm	$38.50
1111-070	N-BK7	32mm(L)x30mm(H)	3.72mm	3mm	300	650-1050nm AR Coating	155.04mm	297.55mm	$38.50
1111-071	N-BK7	32mm(L)x30mm(H)	3.72mm	3mm	300	1050-1580nm AR Coating	155.04mm	297.55mm	$40.50
1111-072	N-BK7	60mm(L)x30mm(H)	3.72mm	3mm	300	Uncoated	155.04mm	297.55mm	$42.00
1111-073	N-BK7	60mm(L)x30mm(H)	3.72mm	3mm	300	650-1050nm AR Coating	155.04mm	297.55mm	$57.50
1111-074	N-BK7	62mm(L)x60mm(H)	5.93mm	3mm	300	Uncoated	155.04mm	296.09mm	Inquire
1111-075	N-BK7	32mm(L)x30mm(H)	3.54mm	3mm	400	Uncoated	206.72mm	397.67mm	$28.00
1111-076	N-BK7	32mm(L)x30mm(H)	3.54mm	3mm	400	350-650nm AR Coating	206.72mm	397.67mm	$38.50
1111-077	N-BK7	32mm(L)x30mm(H)	3.54mm	3mm	400	650-1050nm AR Coating	206.72mm	397.67mm	$38.50
1111-078	N-BK7	32mm(L)x30mm(H)	3.54mm	3mm	500	350-650nm AR Coating	258.40mm	497.74mm	$38.50
1111-079	N-BK7	60mm(L)x30mm(H)	3.43mm	3mm	500	350-650nm AR Coating	258.40mm	497.74mm	$57.50
1111-080	N-BK7	60mm(L)x30mm(H)	3.43mm	3mm	500	650-1050nm AR Coating	258.40mm	497.74mm	$57.50
1111-081	N-BK7	32mm(L)x30mm(H)	3.31mm	3mm	700	Uncoated	361.76mm	697.82mm	$28.00
1111-082	N-BK7	32mm(L)x30mm(H)	3.31mm	3mm	700	350-650nm AR Coating	361.76mm	697.82mm	$38.50
1111-083	N-BK7	60mm(L)x30mm(H)	3.31mm	3mm	700	Uncoated	361.76mm	697.82mm	$42.00
1111-084	N-BK7	32mm(L)x30mm(H)	3.21mm	3mm	1000	350-650nm AR Coating	516.80mm	997.88mm	$38.50
1111-085	N-BK7	60mm(L)x30mm(H)	3.21mm	3mm	1000	Uncoated	516.80mm	997.88mm	$42.00
1111-086	N-BK7	60mm(L)x30mm(H)	3.21mm	3mm	1000	350-650nm AR Coating	516.80mm	997.88mm	$57.50
1111-087	N-BK7	60mm(L)x30mm(H)	3.21mm	3mm	1000	1050-1580nm AR Coating	516.80mm	997.88mm	$61.00

Plano-Concave Cylindrical Lens





- Substrate materials: Fine Annealed N-BK7
- Ideal for one-dimensional magnification of images, laser line generation, and diode laser beam shaping
- Various focal lengths (-3.9mm to -700mm) and a large selection of dimensions
- Standard coating options: uncoated, 350-650nm, 650-1050nm, 1050-1580nm, or custom bandwidths
- Custom Plano Concave Cylindrical Lenses made from Fused Silica, CaF2, BaF2, MgF2, ZnSe, etc. are also available
- Applications: Laser scanners, diode lasers, optical metrologies, spectroscopes, etc.

A Plano Concave Cylindrical Lens is a special kind of plano-concave optical lens component in columnar shape, with one plane side and one concave side. As a plano-concave lens, a plano-concave cylindrical lens has an inward bent curve, contributing to a negative effective focal length (EFL), and both of them perform best at infinite absolute conjugate ratios, and becomes not advantageous when below 5:1. The distinguishment is that the former diverges lights in two dimensions, the later expands light beam along a one-dimensional single axis.

One of the critical functions of a Plano-concave cylindrical lens is transforming two-dimensional light beams into one-dimensional lines. A classic example would be projecting a collimated laser beam onto the concave side of the cylindrical lens, then on the image side the beam will be stretched and magnified into a thin line. Plano-concave cylindrical lenses are the best options for coupling into a slit input, and one-dimensional image stretching. These Plano-concave cylindrical lenses are taking more and more sections in the markets like laser scanners, spectroscopies, dye lasers, acousto-optics, optical processors, and other similar applications.

Another application of Plano-concave cylindrical lenses is to correct for astigmatism and the elliptical shape of the laser beam. Collimate and circularize the output of a laser diode. The flaw of the elliptical output beam shape is intimate in Edge-emitting laser diodes, this is a designed weakness, which is undesirable to the users. Elliptical beams, instead of ideal circular beams, have greater spot sizes, which means lower power efficiencies. Experiments prove, that using a pair of orthogonal Plano-concave cylindrical lens result in a circularized and balance-structured beam with high beam qualities with transmitted power. In addition, the cylindrical lens pair compensated for much of the beam's astigmatism.

N-BK7 or its equivalent known as H-K9L is a ROHS-compliant borosilicate crown glass with superior optical excellence and the glass is fine annealed and polished to tight tolerances to meet the demanding tolerances. The most attractive advantages of N-BK7 are its high optical homogeneities and high transmission to VIS and NIR spectra. Besides, the hardness, chemical and thermal resilience of N-BK7 are also remarkable, it contains low levels of inclusions and bubbles, therefore N-BK7 is excellent for making high-precision optical lenses.

Hangzhou Shalom EO offer stocked N-BK7 Plano-Concave Cylindrical Lenses. The various focal lengths range from -3.9mm to -700mm, while the dimensions also come in diversities to accommodate your requirements. Standard coating options include Uncoated, 350-650nm, 650-1050 nm, and 1050-1580nm anti-reflection coatings to elevate the transmission of the lens substrate, while custom coating bandwidths could be tailored through inquiries. Before shipment, the cylindrical lenses will undergo a stringent in-house inspection in our clean room using Zygo interferometers and other equipment to secure your interest.

Besides the off-the-shelf PCV cylindrical lens made from N-BK7, we also provide custom plano concave cylindrical lens made from a portfolio of other materials including Fused Silica, CaF2, BaF2, MgF2, ZnSe, etc. with BBAR coatings, V-coatings, and cheaper MgF2 AR coatings.

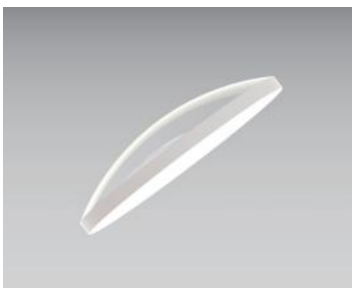
Specifications:

Type	Plano-Concave Cylindrical Lenses	Material	N-BK7
Clear Aperture	>90%	Size Tolerance	+0/-0.1mm
Thickness Tolerance	±0.2mm	Surface Irregularity	λ/4-λ@632.8nm
Surface Quality	60/40 S/D	Focal Length Tolerance	±1%
Chamfer	<0.2mm x 45 degree	Centering Error	<3 arcmin

Product List of Plano-Concave Cylindrical Lens

Code	Material	Size	CT	ET	Focal Length	Coating	Curvature Radius	BFL	Price
1112-001	N-BK7	8mm(L)x4mm(H)	2.0mm	2.7mm	-3.9mm	650-1050nm AR Coating	-2.02mm	-5.22mm	$24.50
1112-002	N-BK7	6mm(L)x4mm(H)	2.0mm	2.6mm	-4.0mm	Uncoated	-2.07mm	-5.32mm	$17.50
1112-003	N-BK7	8mm(L)x4mm(H)	2.0mm	2.6mm	-4.0mm	Uncoated	-2.07mm	-5.32mm	$17.50
1112-004	N-BK7	8mm(L)x4mm(H)	2.0mm	2.6mm	-4.0mm	650-1050nm AR Coating	-2.07mm	-5.32mm	$24.50
1112-005	N-BK7	6mm(L)x4mm(H)	2.0mm	2.4mm	-5.8mm	350-650nm AR Coating	-3.00mm	-7.12mm	$24.50
1112-006	N-BK7	12mm(L)x6mm(H)	2.0mm	3.2mm	-6.4mm	Uncoated	-3.31mm	-7.72mm	$17.50
1112-007	N-BK7	14mm(L)x7mm(H)	2.0mm	3.4mm	-7.7mm	Uncoated	-3.98mm	-9.02mm	$17.50
1112-008	N-BK7	12mm(L)x10mm(H)	2.0mm	4.8mm	-9.7mm	650-1050nm AR Coating	-5.01mm	-11.02mm	$24.50
1112-009	N-BK7	20mm(L)x10mm(H)	2.0mm	4.8mm	-9.7mm	1050-1580nm AR Coating	-5.01mm	-11.02mm	$35.00
1112-010	N-BK7	12mm(L)x10mm(H)	2.0mm	3.8mm	-12.7mm	Uncoated	-6.56mm	-14.02mm	$17.50
1112-011	N-BK7	12mm(L)x10mm(H)	2.0mm	3.8mm	-12.7mm	350-650nm AR Coating	-6.56mm	-14.02mm	$24.50
1112-012	N-BK7	12mm(L)x10mm(H)	2.0mm	3.8mm	-12.7mm	650-1050nm AR Coating	-6.56mm	-14.02mm	$24.50
1112-013	N-BK7	15mm(L)x13mm(H)	2.0mm	5.3mm	-13.7mm	1050-1580nm AR Coating	-7.08mm	-15.02mm	$35.00
1112-014	N-BK7	26mm(L)x13mm(H)	2.0mm	5.3mm	-13.7mm	Uncoated	-7.08mm	-15.02mm	$28.00
1112-015	N-BK7	12mm(L)x10mm(H)	2.0mm	3.4mm	-15.0mm	650-1050nm AR Coating	-7.75mm	-16.32mm	$24.50
1112-016	N-BK7	20mm(L)x10mm(H)	2.0mm	3.4mm	-15.0mm	Uncoated	-7.75mm	-16.32mm	$24.50
1112-017	N-BK7	21mm(L)x19mm(H)	2.0mm	7.9mm	-19.0mm	Uncoated	-9.82mm	-20.32mm	$28.00
1112-018	N-BK7	21mm(L)x19mm(H)	2.0mm	7.9mm	-19.0mm	350-650nm AR Coating	-9.82mm	-20.32mm	$38.50
1112-019	N-BK7	17mm(L)x15mm(H)	2.0mm	4.7mm	-20.0mm	650-1050nm AR Coating	-10.34mm	-21.32mm	$33.50
1112-020	N-BK7	17mm(L)x15mm(H)	2.0mm	4.7mm	-20.0mm	1050-1580nm AR Coating	-10.34mm	-21.32mm	$35.00
1112-021	N-BK7	30mm(L)x15mm(H)	2.0mm	4.7mm	-20.0mm	Uncoated	-10.34mm	-21.32mm	$28.00
1112-022	N-BK7	30mm(L)x15mm(H)	2.0mm	4.7mm	-20.0mm	350-650nm AR Coating	-10.34mm	-21.32mm	$38.50
1112-023	N-BK7	30mm(L)x15mm(H)	2.0mm	4.7mm	-20.0mm	650-1050nm AR Coating	-10.34mm	-21.32mm	$38.50
1112-024	N-BK7	30mm(L)x15mm(H)	2.0mm	4.7mm	-20.0mm	1050-1580nm AR Coating	-10.34mm	-21.32mm	$40.50
1112-025	N-BK7	15mm(L)x12.5mm(H)	2.0mm	3.5mm	-22.2mm	Uncoated	-11.47mm	-23.52mm	$24.50
1112-026	N-BK7	25mm(L)x12.5mm(H)	2.0mm	3.5mm	-22.2mm	Uncoated	-11.47mm	-23.52mm	$28.00
1112-027	N-BK7	12mm(L)x10mm(H)	2.0mm	2.8mm	-25.0mm	Uncoated	-12.92mm	-26.32mm	$17.50
1112-028	N-BK7	12mm(L)x10mm(H)	2.0mm	2.8mm	-25.0mm	650-1050nm AR Coating	-12.92mm	-26.32mm	$24.50
1112-029	N-BK7	12mm(L)x10mm(H)	2.0mm	2.8mm	-25.0mm	1050-1580nm AR Coating	-12.92mm	-26.32mm	$25.50
1112-030	N-BK7	20mm(L)x10mm(H)	2.0mm	2.8mm	-25.0mm	Uncoated	-12.92mm	-26.32mm	$24.50
1112-031	N-BK7	20mm(L)x10mm(H)	2.0mm	2.8mm	-25.0mm	1050-1580nm AR Coating	-12.92mm	-26.32mm	$35.00
1112-032	N-BK7	52mm(L)x26mm(H)	2.0mm	6.5mm	-38.1mm	Uncoated	-19.69mm	-39.42mm	$42.00
1112-033	N-BK7	12mm(L)x10mm(H)	2.0mm	2.5mm	-40.0mm	Uncoated	-20.67mm	-41.32mm	$17.50
1112-034	N-BK7	12mm(L)x10mm(H)	2.0mm	2.5mm	-40.0mm	350-650nm AR Coating	-20.67mm	-41.32mm	$24.50
1112-035	N-BK7	12mm(L)x10mm(H)	2.0mm	2.5mm	-40.0mm	650-1050nm AR Coating	-20.67mm	-41.32mm	$24.50
1112-036	N-BK7	22mm(L)x20mm(H)	2.0mm	3.8mm	-50.0mm	Uncoated	-25.84mm	-51.32mm	$28.00
1112-037	N-BK7	22mm(L)x20mm(H)	2.0mm	3.8mm	-50.0mm	1050-1580nm AR Coating	-25.84mm	-51.32mm	$40.50
1112-038	N-BK7	40mm(L)x20mm(H)	2.0mm	3.8mm	-50.0mm	Uncoated	-25.84mm	-51.32mm	$42.00
1112-039	N-BK7	40mm(L)x20mm(H)	2.0mm	3.8mm	-50.0mm	1050-1580nm AR Coating	-25.84mm	-51.32mm	$61.00
1112-040	N-BK7	32mm(L)x30mm(H)	2.0mm	6.5mm	-50.0mm	Uncoated	-25.84mm	-51.32mm	$28.00
1112-041	N-BK7	53mm(L)x50.8mm(H)	2.0mm	19.9mm	-50.8mm	Uncoated	-26.25mm	-52.12mm	Inquire
1112-042	N-BK7	32mm(L)x30mm(H)	2.0mm	5.6mm	-60.0mm	650-1050nm AR Coating	-31.01mm	-61.32mm	$38.50
1112-043	N-BK7	60mm(L)x30mm(H)	2.0mm	5.6mm	-60.0mm	Uncoated	-31.01mm	-61.32mm	$42.00
1112-044	N-BK7	62mm(L)x60mm(H)	2.0mm	23.5mm	-60.0mm	1050-1580nm AR Coating	-31.01mm	-61.32mm	Inquire
1112-045	N-BK7	53mm(L)x50.8mm(H)	2.0mm	13.6mm	-62.9mm	Uncoated	-32.51mm	-64.22mm	Inquire
1112-046	N-BK7	95mm(L)x50.8mm(H)	2.0mm	13.6mm	-62.9mm	Uncoated	-32.51mm	-64.22mm	Inquire
1112-047	N-BK7	32mm(L)x30mm(H)	2.0mm	5.0mm	-70.0mm	Uncoated	-36.18mm	-71.32mm	$28.00
1112-048	N-BK7	32mm(L)x30mm(H)	2.0mm	5.0mm	-70.0mm	350-650nm AR Coating	-36.18mm	-71.32mm	$38.50
1112-049	N-BK7	60mm(L)x30mm(H)	2.0mm	5.0mm	-70.0mm	Uncoated	-36.18mm	-71.32mm	$42.00
1112-050	N-BK7	53mm(L)x50.8mm(H)	2.0mm	11.1mm	-75.0mm	Uncoated	-38.76mm	-76.32mm	Inquire
1112-051	N-BK7	90mm(L)x50.8mm(H)	2.0mm	11.1mm	-75.0mm	Uncoated	-38.76mm	-76.32mm	Inquire
1112-052	N-BK7	40mm(L)x20mm(H)	3.0mm	4.1mm	-80.0mm	Uncoated	-41.34mm	-81.98mm	$42.00
1112-053	N-BK7	32mm(L)x30mm(H)	3.0mm	5.1mm	-100.0mm	1050-1580nm AR Coating	-51.68mm	-101.98mm	$40.50
1112-054	N-BK7	32mm(L)x30mm(H)	3.0mm	4.6mm	-130.0mm	Uncoated	-67.18mm	-131.98mm	$28.00
1112-055	N-BK7	32mm(L)x30mm(H)	3.0mm	4.4mm	-150.0mm	Uncoated	-77.52mm	-151.98mm	$28.00
1112-056	N-BK7	60mm(L)x30mm(H)	3.0mm	4.4mm	-150.0mm	Uncoated	-77.52mm	-151.98mm	$42.00
1112-057	N-BK7	32mm(L)x30mm(H)	3.0mm	4.0mm	-200.0mm	Uncoated	-103.36mm	-201.98mm	$28.00
1112-058	N-BK7	32mm(L)x30mm(H)	3.0mm	4.0mm	-200.0mm	650-1050nm AR Coating	-103.36mm	-201.98mm	$38.50
1112-059	N-BK7	60mm(L)x30mm(H)	3.0mm	3.8mm	-250.0mm	Uncoated	-129.20mm	-251.98mm	$42.00
1112-060	N-BK7	32mm(L)x30mm(H)	3.0mm	3.3mm	-700.0mm	Uncoated	-361.76mm	-701.98mm	$28.00

Aspheric Lenses

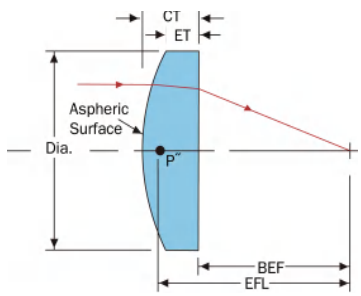


An Aspheric Lens is an optical lens with a special profile, the word "aspheric" here means not being a portion of a sphere. The difference between a normal spherical lens and an aspheric lens is that an aspheric lens has a more complex optical front which varies in radii of curvature from center to edge along the optical axis, such as ellipse, parabola, hyperbola, and quadric. The advantage of an aspheric lens is that its special front shape allows it to mitigate or attenuate the various optical aberrations such as spherical aberrations, chromatic aberration, astigmatism, etc., and elevates the overall qualities of images. The most notable virtue of aspherical lenses is the correction of spherical aberration, which is the innate failure of spherical lenses to converge parallel light into the theoretical focal point, causing a blurring of the light spots. Eliminating the effects of spherical aberration, an aspheric lens presents crisp spots and better image qualities. In addition, an aspheric lens allows a larger numerical aperture (low f-number) and therefore increases the light throughput, achieving higher power efficiencies. Incorporation of aspheric lenses into lens modules also could help to reduce the element number because the former gives them more aberration correction than multiple surfaces of the latter. A Fewer number of aspheric lenses could substitute a handful of spherical lenses. With the exemption of excessive optics for correction of spherical aberrations, the utilization of aspheric lenses enables simplified, compact designs and lowered production costs. The applications of aspheric lenses are manifold, including barcode scanners, laser diode collimation, illuminations, OEM, or Research and Development integration.

Hangzhou Shalom EO offers various types of aspheric lenses including Plano-convex/concave Aspheric Lenses, Biconvex/Biconcave Aspheric Lenses, Meniscus Aspheric Lenses, Ball/half ball aspheric lenses, etc. We are capable of providing Aspheric Lenses of Commercial Grade, Standard Grade High precision Laser Grade. For high-volume production of aspheric lenses, we utilize precision glass molding techniques to obtain efficient productiveness in short timescales. For mid-to-low-scale production, we use the CNC (Computerized Numerical Control)-polishing technique. Compared with the glass molded counterparts, CNC polished lenses are available in larger sizes, provide better surface smoothness, and maintain the M squared values of the input beam better. We also introduced the MRF (Magneto-Rheological Finishing) technique into our production line, where the high-precision polishing technique contributes to true diffraction-limited spot sizes and the lowest wavefront error of the lenses. Our Aspheric Lenses are sold in two categories: Collimation Aspheric Lenses and Condenser Aspheric Lenses. Aspheric collimation lenses are an excellent option for collimating light emerging from fibers or laser diodes. The aspheric condenser lenses exhibit exceptional light-converging capability, creating focal points of intense energy, the lenses are a superb choice to be integrated into laser cutting machines.

Precision Polished Aspheric Lenses (Custom)





- Substrate materials: Optical Glass (e.g. N-BK7, Fused Silica), Ge, ZnSe, Si
- Minimized spherical aberrations
- Various manufacturing techniques: CNC precision polishing, MRF polishing, or single point diamond turning
- Standardized focal lengths and diameters convenient for OEM
- Coating options: uncoated, MgF2 single layer AR coating, laser line V-coating and BBAR coating
- Diameter range : 5mm to 390mm

Shalom EO's Precision Polished Custom Aspheric Lenses are made of various materials including optical glass materials (e.g. N-BK7, Fused Silica), Germanium, Zinc Selenide, Silicon, etc. These aspheric lenses are manufactured using Computer Numerical Control (CNC) precision polishing and grinding, which allows larger lens dimensions, tighter geometric control, and beam qualities. The MRF technique is also employed to achieve diffraction-limited performance and minimize wavefront distortion of the lasers. When it comes to non-glass aspheric lenses, more stringent precision control could be achieved using single-point diamond turning (SPDT) techniques.

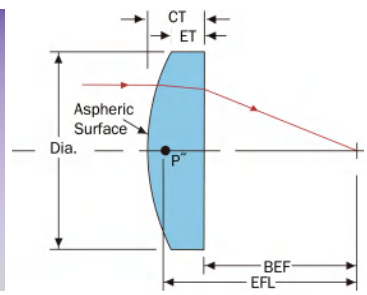
Our aspheric lenses are sold with a transmission range extending from UV to NIR, and diameters are available between 5mm and 390mm. The preforms of our aspheric lenses could be plano-convex/plano-concave lenses, ball/half lenses, meniscus lenses, biconvex/biconcave lenses, achromatic lenses, etc. Custom coating options for Shalom's aspheric lenses include uncoated substrates, Broadband Anti-reflection (BBAR) coatings that effectively reduce reflection (average reflection below 0.5%) over a certain wavelength range, and laser line V-coating which provides higher transmission (average reflection below 0.25%) at a narrower range around a certain wavelength, and MgF2 AR coatings (average reflection below 1.5%) with competitive low price.

Specifications:

Material	BK7, fused silica, optical glass, Ge, ZnSe, Silicon	Surface Quality	10/5 S/D to 40/20 S/D (uncoated)
Clear Aperture	>90%	Diameter Range	5-390mm
Diameter Tolerance	+0.0/-0.03mm	Protective Chamfers	0.3mm max@45°
Thickness Tolerance	±0.02mm	EFL Tolerance	≤0.1%
Asphere Figure Error P-V	<0.65 μm	Surface Form Deviation RMS	≤0.5 μm
Centration	<30"		

Glass Molded Aspheric Lenses (Custom)





- Substrate materials: Optical Glass (e.g., N-BK7, Fused Silica)
- Minimized spherical aberrations
- Manufactured using glass molding technique
- Coating options: uncoated, MgF2 single layer AR coating, laser line V-coating, and BBAR coating
- Diameter range: 5mm to 300mm

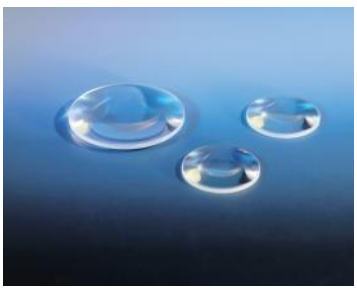
Shalom EO offers Custom Glass Molded Aspheric Lenses made of various optical glass materials (e.g., N-BK7, Fused Silica). The glass molding technique involves a heating procedure of optical glass cores until the cores become malleable enough to be pressed into the aspherical mold. The glass molded aspheres are often available in smaller sizes than the precision polished aspheric lenses, and this technique excels in terms of high productiveness and low incremental cost once the mold is accomplished. The forms of our aspheric lenses could be plano-convex/Plano-concave lenses, ball/half lenses, meniscus lenses, biconvex/biconcave lenses, achromatic lenses, etc.

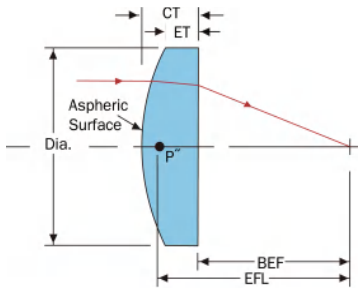
The diameters are available between 5mm and 300mm. Custom coating options for Shalom's aspheric lenses include uncoated substrates, Broadband Anti-reflection (BBAR) coatings that effectively reduce reflection (average reflection below 0.5%) over a certain wavelength range, and laser line V-coating which provides higher transmission (average reflection below 0.25%) at a narrower range around a certain wavelength, and MgF2 AR coatings (average reflection below 1.5%) with competitive low price.

Specifications:

Material	optical glass	Surface Quality	10/5 S/D to 40/20 S/D (uncoated)
Clear Aperture	>90%	Diameter Range	5-280mm
Diameter Tolerance	+0.0/-0.05mm	Protective Chamfers	0.3mm max@45°
Center Thickness Tolerance	≤0.05mm	EFL Tolerance	≤0.1%
Asphere Figure Error P-V	±1 μm	Surface Form Deviation RMS	≤0.5 μm

Aspheric Condenser Lenses (Precision Polished)





- CNC and MRF polishing techniques
- Excellent for collection of light, illumination, projection, etc.
- Compatible with 6000W-30000W continuous laser systems
- Various Lens Types: Plano-convex/concave, biconvex/concave, meniscus, etc.
- Standard coating options include: 400-500nm, 600-700nm, 1065-1085nm, 1070-1080nm, 1060-1090nm AR Coatings.
- Both stocked and custom versions are available

An Aspheric Condenser Lens is a lens with a non-spherical optical front and a positive short focal length excellent for condensing or collecting incident light. The major characteristics of an aspheric condenser are its prowess to correct spherical aberration and its superb strength to collect light. In applications that require large acceptance angles, aspheric lenses are more suitable than spherical lenses as the latter exhibits spherical aberrations and other problems, whilst aspheric lenses provide larger apertures, higher NA, and lower f/# ratios, supporting a wide range of efficient illumination applications (such as light collection, condensing, projection, and detection). Furthermore, the incorporation of aspheric condenser lenses into an optical system allows the simplification of the system, as a single aspheric lens could be an excellent alternative to several spherical converging lenses.

Hangzhou Shalom EO offers Stocked and Custom Aspheric Condenser Lenses made of UV Fused Silica, the aspheric condenser is compatible with 6000W-30000W continuous laser systems. The aspheric lenses are CNC Precision Polished to obtain precise control of the qualities of the lens surface. MRF technique is also harnessed to deliver lenses that commit diffraction-limited performances and introduce minimum wavefront distortions. Through a rational combination of material selection, manufacturing, coating, and inspection, we can fabricate products of reproducible qualities that meet our published standards.

Regarding our standard aspheric condensers, the aspheric condenser lenses are available in three standard diameters: 37mm, 38.1mm, or 50.8mm, with focal lengths ranging from 150mm to 350mm. Coating options are manifold, including 400-500nm, 600-700nm, 1065-1085nm, 1070-1080nm, and 1060-1090nm AR Coatings. Other custom specifications could be tailored upon request. Besides, we also provide Precision Polished Custom Aspheric Lenses made of various materials including Germanium, Zinc Selenide, Silicon, etc., these custom precision polished aspheric lenses can be CNC/MRF processed or polished using single point diamond turning (SPDT).

Specifications:

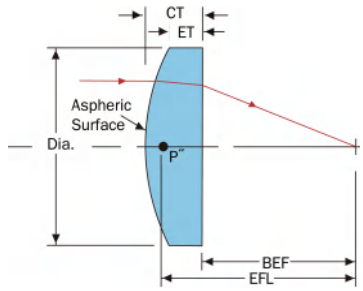
Material	Fused Silica	Surface Quality (S/D)	10/5, 20/10
Clear Aperture	>90%	Centration	<30"
Protective Chamfers	0.3mm max@45°		

Product List of Aspheric Condenser Lens (Precision Polished)

Code	Types	Material	Diameter	EFL	CT	Coating
1115-001	Meniscus Aspheric Condenser Lens	Fused Silica	Φ37mm	200mm	4mm	1060-1090nm AR Coating
1115-002	Biconvex Aspheric Condenser Lens	Fused Silica	Φ37mm	200mm	6mm	1060-1090nm AR Coating
1115-003	Plano-convex Aspheric Condenser Lens	Fused Silica	Φ38.1mm	200mm	6.0271mm	1070-1080nm AR Coating
1115-005	Plano-convex Aspheric Condenser Lens	Fused Silica	Φ38.1mm	300mm	5.3482mm	1070-1080nm AR Coating
1115-006	Plano-convex Aspheric Condenser Lens	Fused Silica	Φ38.1mm	300mm	5.1549mm	1070-1080nm AR Coating
1115-007	Plano-convex Aspheric Condenser Lens	Fused Silica	Φ50.8mm	300mm	5mm	1065-1085nm AR Coating

Aspheric Condenser Lenses (Precision Polished)





- Precision glass CNC or sometimes MRF polished
- Compatible with 6000W-30000W continuous laser systems
- Ideal for aligning or calibrating optical devices
- Available both in stocked and custom versions
- Standard coating options: 600-700nm, 400-500nm, 550-650nm, 850-1100nm,1070-1080nm, 1065-1085nm, 1060-1090nm AR coatings

An Optical Collimator is a device that narrows an optical beam, making the divergent light parallel by compressing the spreading angle. Optical collimators can be used to calibrate other optical devices, to make sure all elements are aligned on the optical axis, to set elements at proper focus, or to align two or more devices. Compared with normal spherical collimators, Aspheric Collimators excel in terms of minimized spherical aberrations, which also contributes to the simplification of the whole lens group.

Hangzhou Shalom EO offers Stocked and Custom Aspheric Collimators, enabling you to adjust the field of view, collection efficiencies, and spatial resolution. Our aspheric collimators are precision CNC polished, sometimes MRF polished, in our state-of-the-art workshop, superior optical standards are obtained through cautious material selection, meticulous cutting, careful grinding and polishing, and stringent inspection. By controlling each production stage, we can realize the reduplication and steadiness of the quality of our products. Our aspheric collimators are compatible with 6000W-30000W continuous laser systems, the lens could take various forms such as plano-convex, meniscus, biconvex, etc. The standard coating options include 1070-1080 nm AR coatings, 1065-1085 nm AR coatings, 1060-1090 nm AR coatings, 600-700 nm AR coatings, 400-500 nm AR coatings, 550-650 nm AR coatings, and 850-1100 nm AR coatings.

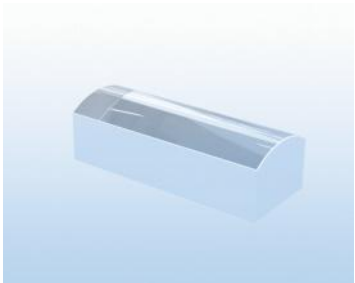
Specifications:

Material	Fused Silica	Surface Quality (S/D)	10/5, 20/10
Clear Aperture	>90%	Centration	<30"
Protective Chamfers	0.2mm@45°, 0.25mm@45°		

Product List of Aspheric Collimator (Precision Polished)

Code	Types	Material	Diameter	EFL	CT	Coating
1116-001	Biconvex Aspheric Collimator Lens	Fused Silica	Φ37mm	100mm	8mm	1060-1090nm AR Coating
1116-002	Plano-convex Aspheric Collimator Lens	Fused Silica	Φ38.1mm	100mm	8.1156mm	1070-1080nm AR Coating
1116-003	, Biconvex Aspheric Collimator Lens	Fused Silica	Φ38.1	100mm	6mm	1060-1090nm AR Coating
1116-004	Plano-convex Aspheric Collimator Lens	Fused Silica	Φ38.1	125mm	7.2681mm	1070-1080nm AR Coating
1116-005	Meniscus Aspheric Collimator Lens	Fused Silica	Φ38.1mm	200mm	6mm	1060-1090nm AR Coating
1116-006	Plano-convex Aspheric Collimator Lens	Fused Silica	Φ50.8mm	120mm	11mm	1065-1085nm AR Coating

Fast Axis Collimators



- Large numerical apertures and minimized absorption loss (transmission >99%)
- Ideal for collimating lights from diode lasers into fibers
- Made of UV Fused Silica
- Available both in standard (Dia 38.1mm, 50.8mm, 790-990nm AR coatings) or custom versions
- Great when used in conjunction with our slow axis collimators

Fast Axis Collimators (FAC-Lenses) are cylindrical lenses each with an aspheric optical front and a flat backside aimed for collimating spreading light beams from a Diode Laser along the fast axis. The FAC lenses compress the diverging laser lights from a laser diode into paralleled lights and adjust the beam profile. A fast-axis collimator is the most important component in the high-power diode.

Hangzhou Shalom offers Stocked and Custom Aspheric Fast Axis Collimators. Our fast axis collimators highlight large numerical apertures (NA), and AR coatings with minimized absorption for high-power applications making it possible to collimate all portions of diode output with excellent beam qualities. The greatest altitudes of beam-shaping effectiveness for diode lasers are assured through high transmission and good collimation properties.

The Stocked Aspheric Fast Axis collimators are made of UV Fused Silica, the product is compatible with the 6000-30000W continuous laser. Our standard Aspheric Fast Axis Collimators are available in diameters of 38.1mm and 50.8mm, coating options include 790-990nm standard ar coatings or custom coatings. Within the working wavelength range, our fast axis collimator supports an eminent optical transmission greater than 99%. Various glass substrate materials are accessible for selection. In addition, our Slow Axis Collimators could be used in conjunction with the FAC lenses with tailored specifications.

Specifications:

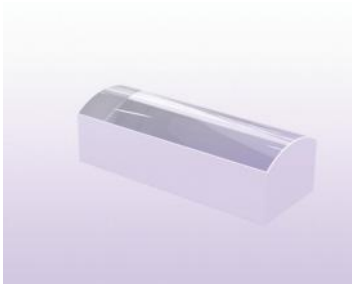
Materials	Optical Glass	Coating Wavelength Range	790-990nm
Coating	BBAR Coating (790-990nm)	Coating Specification	Ravg<1.0%@790-990nm
Design Wavelength	808nm	Height Tolerance	±0.05mm
Length Tolerance	±0.05mm	Dimension	Custom
Surface Flatness	λ/4	Width Tolerance	±0.01mm
Transmission	>99%	Numerical Aperture	0.8
Collimation Power	>80% within 1.15xDIV; >85% within 1.30xDIV		

Modules or Types:

Shalom EO provides the following standard modules of fast-axis collimators. Besides, we also accept custom orders.

Type	FAC300	FAC360	FAC600
Effective focal length EFL (μm)	300±70@940nm	360±70@940nm	600±70@940nm
Back Focal Length (μm)	70±30@940nm	70±30@940nm	140±30@940nm
Residential Divergence@X% Power Enclosure	±2.50@85%	±2.00@85%	±1.50@85%
Numerical Aperture (Design)	0.8	0.8	0.8
Wavelength (nm)	780-1000/430-470	780-1000	780-1000
Broadband AR-Coating Reflection avg. (AOI) [%]	Ra <= 0.4 (0°- 35°)	Ra <= 0.4 (0°- 35°)	Ra <= 0.4 (0°- 35°)
Coating Durability	MIL-C-675	MIL-C-675	MIL-C-675
Dimensions (Height x Thickness x Length) [mm]	0.5(±0.05)x0.43(±0.03)x4.0(±0.05)	0.6(±0.05)x0.53(±0.03)x4.0(±0.05)	1.0(±0.05)x0.82(±0.03)x4.0(±0.05)
S1 Clear Aperture (Height x Length) [mm]	0.3x3.5	0.3x3.5	0.3x3.5
S1 Surface Imperfections (acc. MIL-PRF-1380B)	20-10	20-10	20-10
S2 Clear Aperture (Height x Length) [mm]	0.4X3.5	0.5X3.5	0.9X3.5
S2 Surface Imperfections (acc. MIL-PRF-1380B)	20-10	20-10	20-10
Edge Chipping (mm)	0.1	0.1	

Slow Axis Collimators



- Substrate Materials: Custom Glass Materials
- Low Scatter and Efficient Collimation
- Mechanical Durability
- AR Coatings furnished
- Ideal for: High Power Laser Bars and Stacks, Fiber-Coupled Direct Diode, Solid State Laser Pumping, etc

Slow Axis Collimators (SAC-Lenses) axis collimators are optical components used in lasers, often in diode lasers, to shape and control the output beam. Slow-axis collimators are designed to reduce the divergence angle along the slow axis of asymmetric beam emission from diode lasers, leading to a more symmetrical output beam profile. The aspheric design of the SAC lenses results in low spherical aberrations and therefore efficient collimation of the slow-axis dimensions.

Hangzhou Shalom EO offers Custom Slow Axis Collimators (SAC-lenses) with high-precision fabrication which contributes to low scattering and crosstalk and AR coatings. We implement a strict inspection procedure in our clean house, where we strive to minimize the deviation between the published standards and the actual qualities. The products are compatible with various laser bars and laser stacks and capable of handling high power densities. Flexible custom designs could be tailored upon request. Combined usage with our Fast-Axis-Collimators is recommendable.

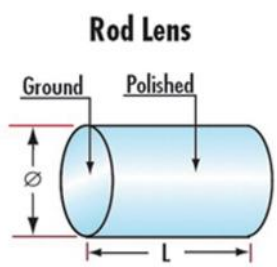
Specifications:

Materials	Optical Glass	Coating Wavelength Range	790-990nm
Coating	BBAR Coating (790-990nm)	Coating Specification	Ravg<1.0%@790-990nm
Design Wavelength	808nm	Height Tolerance	±0.05mm
Length Tolerance	±0.05mm	Dimension	Custom
Surface Flatness	λ/4	Pitch	500μm
Transmission	>99%	Clear Aperture	Custom

Application Notes: Apart from the 790-990nm AR coating, we can also provide custom other custom coating options, attached mounts, and sustaining structures can be offered as well.

Rod Lenses





- Substrate materials: BK7, fused silica or other optical glass
- Focuses collimated light into a line
- Minimum diameter: 0.6mm
- Roundness error: down to 0.005mm
- Diameter tolerance: down to 0.01mm

Rod Lenses are optical lenses in the form of a round rod and focus collimated beams into one dimension. Light is transferred against the circumference of the lens, therefore the circumferences of the rod lenses are precision polished, whilst the two flat ends are irrelevant to optical processing, but could

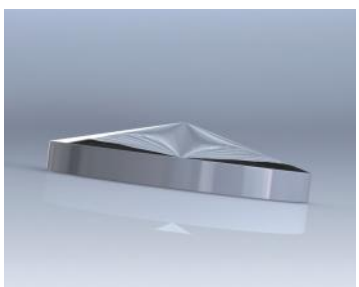
be ground also. The uses of rod lenses include collimation of divergent light, linear focusing, and image inversion lenses between the objective and the ocular lenses in a rigid endoscope (A medical instrument to observe inside human bodies). A rod lens could also be utilized as a light pipe (An optical component that transfers light between the flat ends using total reflection.)

Hangzhou Shalom EO offers a series of custom Rod Lenses made from various optical materials such as, but not limited to UV-fused silica, N-BK7. The transmission of our rod lenses extends from UV, Visible, to NIR. Our rod lenses feature industrial-grade polished surface quality (60/40 S/D), that are competent at being applied as endoscope lenses, light pipes, and laser processing lenses. Custom coating options for rod lenses include uncoated substrates, Broadband Anti-reflection (BBAR) coatings that effectively reduce reflection (average reflection below 0.5%) over a certain wavelength range, and laser line V-coating which provides higher transmission (average reflection below 0.25%) at a narrower range around a certain wavelength, and MgF2 AR coatings (average reflection below 1.5%) with competitive low price.

Specifications:

Type	Rod Lenses	Material	UV fused silica, BK7 or other optical glass
Diameter Tolerance	down to +/-0.01mm	Roundness Error	Down to 0.005mm
Length Tolerance	±0.1mm	Surface Quality	60/40 S/D

Axicon (Conical Lens)



- Creating an approximation of a diffraction-free Bessel beam or converting laser light into an annular shape
- Made of high-quality UV Fused Silica
- High-precision polished
- Superior performance for high-power lasers
- Base angles available from 0.5°to 40°
- Standard diameters 1/2' and 1', custom diameters φ12.7mm-φ 300mm

An Axicon or a Conical Lens is an optical lens with a conical side and flat side, it is defined by its base angles and its apex angle.

The working principle of an axicon is that it uses interference to create a focal line along the optical axis. Axicons could be utilized to generate an approximation of a diffraction-free Bessel beam, which is a beam consisting of a series of concentric rings having equal power through transforming collimated Gaussian beam in the near field. Although a Bessel beam does not exist in real life because it would require infinite energy to create, axicons offer a good analog by maintaining the non-diffractive Bessel beam properties over a distance much longer than a similar Gaussian beam. Bessel beams can be applied in atom or molecule guiding, optical trapping, and medical treatments. A plano-convex axicon could also be used to convert laser light into an annular shape by taking the projection in the far field, and the ring's thickness will be 1/2 of the incident laser beam's diameter. This trait grants axicons aptness for laser hole drilling, microscopes, and medical applications. Note that when converting a collimated light beam into a ring, the plano surface of the axicon should face the input light source.

Hangzhou Shalom EO offers Custom Axicons (Conical Lenses). The axicons are in plano-convex shape, made of high-quality Fused Silica, and are high-precision polished, featuring superior performance excellent for high-power lasers. The base angles of the axicons range from 0.5°to 40°. The stocked axicons are uncoated, but we also provide coating options comprising: 400-700nm, Ravg＜0.5% AOI 0°； 650-1100nm, Ravg＜0.5% AOI 0°; 1050-1700nm, Ravg＜0.5% AOI 0°. Besides the standard 12.7mm and 25.4mm diameters, custom diameters within the range of φ12.7mm-φ300mm are accessible.

Specifications:

Lens Form	Axicon Lens	Material	UV Fused Silica
Diameter Tolerance	+0.0/-0.1mm	Thickness Tolerance	±0.1mm
Angular Tolerance	0.1°	Surface Quality (S/D)	40/20
Surface Flatness (S2)	λ/4@633nm	Surface 1 Deviation(RMS,S1)	<0.15μm
Surface Roughness (RMS, S1)	<6 angstrom		

Product List of Axicon (Conical Lens)

Code	Types	Material	Diameter	CT	Coating	Physical Angle
1114-001	Plano Convex Axicon	Fused Silica	12.7mm	5.05mm	Uncoated	0.5°
1114-002	Plano Convex Axicon	Fused Silica	25.4mm	5.11mm	Uncoated	0.5°
1114-003	Plano Convex Axicon	Fused Silica	12.7mm	5.1mm	Uncoated	1°
1114-004	Plano Convex Axicon	Fused Silica	25.4mm	5.22mm	Uncoated	1°
1114-005	Plano Convex Axicon	Fused Silica	12.7mm	5.21mm	Uncoated	2°
1114-006	Plano Convex Axicon	Fused Silica	25.4mm	5.43mm	Uncoated	2°
1114-007	Plano Convex Axicon	Fused Silica	12.7mm	5.52mm	Uncoated	5°
1114-008	Plano Convex Axicon	Fused Silica	25.4mm	6.09mm	Uncoated	5°
1114-009	Plano Convex Axicon	Fused Silica	25.4mm	7.24mm	Uncoated	10°
1114-010	Plano Convex Axicon	Fused Silica	25.4mm	9.62mm	Uncoated	20°
1114-011	Plano Convex Axicon	Fused Silica	25.4mm	15.66mm	Uncoated	40°

Sapphire Lenses



Sapphire is a high-performance artificial birefringent crystal material with hexagonal lattice structures, fabricated using fine Al2O3 as ingredients. The optical transmission spectrum of sapphire encompasses Ultraviolet, Visible, and Infrared, spanning from 150nm to 5500nm. The most eminent feature of sapphire is its incomparable hardness. As the world's second hardest material with a Mohs index of 9, sapphire is of extreme resistance to abrasions and scratches to withstand extreme conditions and secure long-term durabilities.

Sapphire Optics, therefore, holds a natural advantage with superior ruggedness when compared with optics made from other materials, in fact, sapphire optics can seldom be scraped using materials other than diamonds and themselves. Besides, Sapphire optics is also capable of working under high-pressure, insoluble in water and most acids and alkalis, and its operating temperature limit is up to 1900℃ with its outstanding thermal conduction properties

Hangzhou Shalom EO supplies a series of Sapphire Optical Lenses with custom and off-the-shelf specifications including sapphire lenses, sapphire ball lenses and half ball lenses, and sapphire domes.

With cutting-edge techniques and an efficient production line, Shalom EO is capable of manufacturing both industrial-grade AlO3 optics and high-precision sapphire optics assigned to specific industrial demands with more rigorous requirements and making flexible responses to large-scale orders. Our sales and engineering group with profound technical backgrounds are competent and willing to propose and design the products that best suit your interest at optimized prices with high cost-effectiveness.

Sapphire Ball Lenses and Half-ball Lenses



- Diameters up to 300mm
- Large wavelength range: 0.15~5μm
- Extreme hardness for harsh environment
- Chemical and erosion resistant front surface
- Stocked and Custom Sapphire Ball lenses and Half-Ball lenses Available

Ball lenses belong to a special form of biconvex lenses which have the geometry of a ball (sphere). Ball lenses are manufactured from a single optical material with good transmittance in the wavelength region of interest. The conventional applications of ball lenses include focusing light in the field of fibers(e.g. laser to fiber coupling, fiber to fiber coupling), emitters, and detectors, in major to collimate light depending on the geometries of the input light source. Also, ball lenses could be ball pre-forms of aspheric lenses where ball lenses are deformed on purpose to prevent spherical aberrations.

Half-Ball lenses are variants of ball lenses, obtained through cutting the ball lenses in half. Due to the ease of mounting derived from the one flat surface, half-ball lenses are more convenient for applications where space limitations exist and more compact designs are required, such as fiber communication, endoscopes, microscopes, optical pick-up devices, and laser measurement facilities.

There are three essential parameters of ball lenses and half-ball lenses. One is the effective focal length (EFL), which is the distance between a plane through the

center of the lens and the beam waist (focus) of a collimated input beam. Another is back focal length (BFL), defined as the distance of the focal point from the lens surface, therefore half the diameter smaller than the EFL. The last is numerical aperture (NA), for collimated incident light, the numerical aperture (NA) of the ball lens is dependent on the size of the ball lens (D), its index of refraction (n), and the diameter of the input source (d). Numerical aperture is proportionate to the resolution of the lens, the larger the NA, the more the light is collected by the lens.

Besides the customized versions, Hangzhou Shalom EO also provides stocked ball lenses and half-ball lenses made from Sapphire. The specifications of the custom ball and half-ball lenses could be varied upon your request. Besides, sapphire lenses of other custom shapes including plano-convex, Plano-concave, meniscus, and double-concave/convex are also available in Shalom EO.

Here are some important features of Sapphire:

Sapphire:

Optical-grade Sapphires chosen to produce optical components are Alpha Single Crystal Sapphires, chemical formula Al2O3, with a wide transmission range from 0.225-5.5μm. Sapphire has a hexagonal structure. The lattice constant is a=b=4.758A, c=12.991A, and the refractive index is 1.762-1.770. Its strong covalent bonds contribute to the enduring and solid nature of sapphire. Its Mohs hardness is 9, ranking right after diamond, and its anti-compression strength is between 1.9-24 GPa. Young's Modulus of sapphire is 380Gpa, which is about twice the magnitude of irons. The melting temperature of sapphire is high,2045 °C, which enables sapphire to be engaged in manifolds of applications requiring high thermal loads.

Sapphire lenses are ideal for demanding applications because of their eminent performance, consisting of superior surface hardness (9 on the Mohs scale, the third hardest mineral, after diamond at 10 and moissanite at 9.5, which means high resistance to scratch and abrasion), high thermal conductivities, outstanding dielectric properties and resistance to common chemical acids and alkalis. In addition, sapphire features a high index of refraction and excellent broadband transmission characteristics.

Specifications:

Materials	Optical grade sapphire crystals	Diameter Range	~300mm
Diameter Tolerance	+0.0/-0.2mm	Thickness Tolerance	+/-0.2mm
Surface Quality	60/40 S/D	Fringes (N)	3
Irregularity (delta N)	1	Centration	3'
Chamfer	0.1-0.3mmx45 degree		

Physical and Optical Properties:

Transmission Range	0.17 to 5.5 μm	Refractive Index	No 1.75449; Ne 1.74663 at 1.06 μm (1)
Reflection Loss	14% at 1.06 μm	Absorption Coefficient	0.3 x 10-3 cm-1 at 2.4 μm(2)
Reststrahlen Peak	13.5 μm	dn/dT	13.1 x 10-6 at 0.546 μm(3)
dn/dμ = 0	1.5 μm	Density	3.97 g/cc
Melting Point	2040°C	Thermal Conductivity	27.21 W m-1 K-1 at 300K
Thermal Expansion	5.6 (para) & 5.0 (perp)x 10-6/K*	Hardness	Knoop 2000 with 2000gindenter
Specific Heat Capacity	763 J Kg-1 K-1 at 293K(4)	Dielectric Constant	11.5 (para) 9.4 (perp)、at 1MHz
Youngs Modulus (E)	335 GPa	Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa	Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	300 MPa (45,000 psi)	Poisson Ratio	0.25
Solubility	98 x 10-6 g/100g water	Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c		

Product List of Sapphire Ball Lenses and Half-ball Lenses

Code	Types	Material	Diameter	EFL	Coating	Unit Price
1105-003	Ball	Sapphire	1.0mm	0.57mm	None	$10.0
1106-003	Half-Ball	Sapphire	1.0mm	-	None	Inquiry
1105-006	Ball	Sapphire	2.0mm	1.15mm	None	$10.0
1106-006	Half-Ball	Sapphire	2.0mm	-	None	$10.0
1105-009	Ball	Sapphire	3.0mm	1.72mm	None	$10.0
1106-009	Half-Ball	Sapphire	3.0mm	-	None	Inquiry
1105-012	Ball	Sapphire	4.0mm	2.30mm	None	$12.0
1106-012	Half-Ball	Sapphire	4.0mm	-	None	$12.0
1105-015	Ball	Sapphire	5.0mm	2.87mm	None	$12.0
1106-015	Half-Ball	Sapphire	5.0mm	-	None	$12.0
1105-018	Ball	Sapphire	6.0mm	3.45mm	None	$15.0
1106-018	Half-Ball	Sapphire	6.0mm	-	None	Inquiry
1105-021	Ball	Sapphire	7.0mm	4.02mm	None	Inquiry
1106-021	Half-Ball	Sapphire	7.0mm	-	None	Inquiry
1105-024	Ball	Sapphire	8.0mm	4.60mm	None	$18.5
1106-024	Half-Ball	Sapphire	8.0mm	-	None	Inquiry
1105-027	Ball	Sapphire	9.0mm	5.17mm	None	$20.0
1106-027	Half-Ball	Sapphire	9.0mm	-	None	$21.0
1105-030	Ball	Sapphire	10.0mm	5.75mm	None	$23.0
1106-030	Half-Ball	Sapphire	10.0mm	-	None	$23.0

Sapphire Lenses



- Unparalleled mechanical hardness and chemical stability
- Superb thermal and stress endurance
- Wide Transmission Range: 0.25-5.5μm
- Ideal for application from UV to MWIR
- Various lenses: Ball/Half Ball, Plano-convex/concave, meniscus, etc.
- AR coating available

Lenses are optical components utilized for focusing or diverging light. Sapphire Lenses are ideal for demanding applications (such as lasers) and harsh environments because of their extreme surface hardness, high thermal conduction, high dielectric constants, and resistance to common chemical acids and alkalis. Sapphire (Al_2O_3) is the second hardest crystal next to diamond, and because of their structural strength, sapphire crystal lenses can be made much thinner than other common materials. Sapphire has decent transmission rates from 0.15 to 5.5μm, which covers the ultraviolet (UV) to mid-wave infrared (MWIR) wavelength range.

Hangzhou Shalom EO offers Custom Sapphire Lenses upon the customer's request, and lenses with anti-reflection and other thin film coatings are available. The precision, focal length, lens shape (ball/half ball, plano-convex/concave, double-concave, meniscus, etc.), and other specifications of the sapphire lens could be tailored. The kinds of sapphire we offer include Random, C-cut (also known as Z-cut), or other custom orientations. Our sapphire lenses are excellent for incorporation into various multi-spectral and Infrared optical and laser facilities.

Specifications:

Lens Shape	Plano-convex, Plano-concave, Bi-convex/concave, Meniscus lenses, Ball/Half-Ball, etc.	Materials	Optical grade single crystal sapphire
Aperture	>90%	Diameter Tolerance	+0.0/-0.2mm
Thickness Tolerance	+/-0.2mm	Centering Error	3 arc minutes
Surface Quality	Option: 60/40, 40/20 or 20/10 S/D	Parallelism	1 arc minute
Coating	According to customer's requirement		

Basic Properties:

Physical and Optical Properties			
Transmission Range	0.17 to 5.5 μm	Refractive Index	No 1.75449; Ne 1.74663 @ 1.06 μm (1)
Reflection Loss	14% at 1.06 μm	Absorption Coefficient	0.3 x 10-3cm-1 @ 2.4 μm (2)
Reststrahlen Peak	13.5 μm	dn/dT	13.1 x 10-6 @ 0.546 μm (3)
dn/dμ = 0	1.5 μm	Density	3.97 g/cc
Melting Point	2040°C	Thermal Conductivity	27.21 W m-1 K-1 @ 300K
Thermal Expansion	5.6 (para) & 5.0 (perp) x 10-6 /K *	Hardness	Knoop 2000 with 2000g indenter
Specific Heat Capacity	763 J Kg-1 K-1 @ 293K (4)	Dielectric Constant	11.5 (para) 9.4 (perp) @ 1MHz
Youngs Modulus (E)	335 GPa	Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa	Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	300 MPa (45,000 psi)	Poisson Ratio	0.25
Solubility	98 x 10-6 g/100g water	Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c		

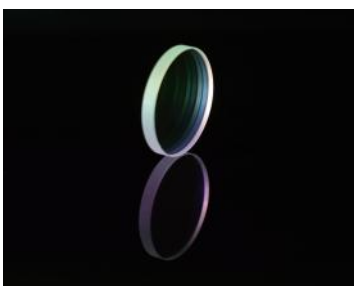
Optical Mirrors



Optical mirrors are optical components designed to reflect light. According to the different intentions of designs, the shape of the mirror also varies. Optical mirrors could be flat or curved (convex or concave). Optical mirrors are indispensable components in a diverse range of industries and research fields, such as medicine, semiconductor, astronomy, life science, and metrology.

Hangzhou Shalom EO offers a range of optical mirrors, including dielectric coated mirrors, enhanced Al coated mirrors, protective silver/gold coated mirrors, low Group Delay Dispersion (GDD) mirrors, and ultrafast-enhanced silver mirrors, for applications in the UV, Visible, and IR spectral ranges. Stocked and custom optical mirrors are available. One of our know-how is the manufacturing of high-precision optical mirrors, with cutting-edge processing technologies, the mirrors feature superior surface flatness and high damage threshold, being capable of handling high-power laser applications. Super Polished Mirror and Mirror Substrates with <1 Angstrom roughness are also available.

UV Fused Silica Laser Line Mirrors



- Made of Corning UV-grade Fused Silica
- Stocked and custom mirrors are available
- High Flatness λ/10, High SQ: 10/5 S/D
- Wide angle of Incidence(AOI): 0-45°
- Multiple Broadband options: HR400-750nm, HR750-1100 nm, HR1280-1600 nm or custom

Shalom EO's UV Fused Silica Broadband Mirrors feature high reflectance over four broadband wavelength regions from visible to NIR spectrum. The average reflection rate is maintained above 98% at 0-45° incident angles. Both standard and custom versions are available.

The mirror substrates are made from UV Fused Silica sourced from Corning. The glass material is fabricated using SiO2 with few inclusions. UV Fused Silica is known for its superior optical properties, in addition to high scratch resistance and low thermal expansion.

Mirror substrates are then coated with a broadband dielectric coating. The technique of dielectric coating refers to periodically stacking multiple thin layers made of dielectric materials with different dielectric constants. When the incident wavelength satisfies certain conditions, these thin layers will function as a special Bragg optical grating, reflecting the incident light. Compared with metallic coatings, higher reflectance could be obtained using dielectric coating and therefore are more recommendable for applications requiring ultra-high reflectance. Another advantage is that dielectric mirrors are more durable and resistant to scratching and wiping than metallic mirrors.

Shalom EO is a leading supplier of optical mirrors. With over ten years of experience, we have developed our high-tech production line and in-house ISO9001-compliant inspection labs to ensure the quality of our products before dispatch. Apart from industrial-grade mirrors, we also offer super-polished mirror substrates.

Specifications:

Material	Corning UV-grade Fused Silica	Diameter	12.7mm，25.4mm，50.8mm
Thickness	3mm,6mm,12mm	Surface Quality	10/5 S/D
Flatness	λ/10	Coating	400-750nm,750-1100nm,1280-1600nm
AOI	0-45°	Application	HeCd, Ar+, Nd: YAG, HeNe,Yb: KGW/KYW lasers

Product List of UV Fused Silica Laser Line Mirrors

Code	Wavelength	Diameter	Thickness	Flatness	Coating	AOI	Application	Unit Price
122-001	442nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	HeCd	$30.5
122-002	442nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	HeCd	$50.0
122-003	442nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	HeCd	$118.0
122-004	488-515nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	Ar+	$30.5
122-005	488-515nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	Ar+	$50.0
122-006	488-515nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	Ar+	$118.0
122-007	515nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	Yb:KGW/KYW 2H	$30.5
122-008	515nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	Yb:KGW/KYW 2H	$50.0
122-009	515nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	Yb:KGW/KYW 2H	$118.0
122-010	532nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	Nd:YAG 2H	$30.5
122-011	532nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	Nd:YAG 2H	$50.0
122-013	589nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	Dye	$30.5
122-014	589nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	Dye	$50.0
122-015	589nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	Dye	$118.0
122-016	633nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	HeNe	$30.5
122-017	633nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	HeNe	$50.0
122-018	633nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	HeNe	$118.0
122-019	670nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	LD	$30.5
122-020	670nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	LD	$50.0
122-021	670nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	LD	$118.0
122-022	694nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	Ruby	$30.5
122-023	694nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	Ruby	$50.0
122-024	694nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	Ruby	$118.0
122-025	780nm	12.7mm	3.0mm	λ/10	750-1100nm	0-45°	LD	$33.5
122-026	780nm	25.4mm	6.0mm	λ/10	750-1100nm	0-45°	LD	$53.0
122-027	780nm	50.8mm	12.0mm	λ/10	750-1100nm	0-45°	LD	$124.5
122-028	760-840nm	12.7mm	3.0mm	λ/10	760-840nm Low GDD	0-45°	Ti:Sa 1H	$45.5
122-029	760-840nm	25.4mm	6.0mm	λ/10	760-840nm Low GDD	0-45°	Ti:Sa 1H	$60.5
122-030	760-840nm	50.8mm	12.0mm	λ/10	760-840nm Low GDD	0-45°	Ti:Sa 1H	$136.5
122-031	852nm	12.7mm	3.0mm	λ/10	750-1100nm	0-45°	LD	$33.5
122-032	852nm	25.4mm	6.0mm	λ/10	750-1100nm	0-45°	LD	$53.0
122-033	852nm	50.8mm	12.0mm	λ/10	750-1100nm	0-45°	LD	$124.5
122-034	980nm	12.7mm	3.0mm	λ/10	750-1100nm	0-45°	LD	$33.5
122-035	980nm	25.4mm	6.0mm	λ/10	750-1100nm	0-45°	LD	$53.0
122-036	980nm	50.8mm	12.0mm	λ/10	750-1100nm	0-45°	LD	$124.5
122-037	1000-1060nm	12.7mm	3.0mm	λ/10	1000-1060nm Low GDD	0-45°	Yb:KGW/KYW 1H	$45.5
122-038	1000-1060nm	25.4mm	6.0mm	λ/10	1000-1060nm Low GDD	0-45°	Yb:KGW/KYW 1H	$60.5
122-039	1000-1060nm	50.8mm	12.0mm	λ/10	1000-1060nm Low GDD	0-45°	Yb:KGW/KYW 1H	$136.5
122-040	1064nm	12.7mm	3.0mm	λ/10	750-1100nm	0-45°	Nd:YAG 1H	$33.5
122-041	1064nm	25.4mm	6.0mm	λ/10	750-1100nm	0-45°	Nd:YAG 1H	$53.0
122-042	1064nm	50.8mm	12.0mm	λ/10	750-1100nm	0-45°	Nd:YAG 1H	$124.5
122-043	1310nm	12.7mm	3.0mm	λ/10	1280-1600nm	0-45°	YAG	$38.0
122-044	1310nm	25.4mm	6.0mm	λ/10	1280-1600nm	0-45°	YAG	$57.5
122-045	1310nm	50.8mm	12.0mm	λ/10	1280-1600nm	0-45°	YAG	$130.5
122-046	1550nm	12.7mm	3.0mm	λ/10	1280-1600nm	0-45°	LD	$38.0
122-047	1550nm	25.4mm	6.0mm	λ/10	1280-1600nm	0-45°	LD	$57.5
122-048	1550nm	50.8mm	12.0mm	λ/10	1280-1600nm	0-45°	LD	$130.5

UV Fused Silica Dielectric Broadband Mirrors



- Made of Corning UV grade Fused Silica
- Stocked and custom mirrors available
- High Flatness λ/10, High SQ: 10/5 S/D
- Wide angle of Incidence(AOI): 0-45°
- Multiple Broadband options: HR400-750nm, HR750-1100nm, HR1280-1600nm or custom

Shalom EO's UV Fused Silica Broadband Mirrors feature high reflectance over four broadband wavelength regions from visible to NIR spectrum. The average reflection rate is maintained above 98% at 0-45° incident angles. Both standard and custom versions are available.

The mirror substrates are made from UV Fused Silica sourced from Corning. The glass material is fabricated using SiO2 with few inclusions. UV Fused Silica is known for its superior optical properties, in addition to high scratch resistance and low thermal expansion.

Mirror substrates are then coated with a broadband dielectric coating. The technique of dielectric coating refers to stacking in period of multiple thin films made of dielectric materials with different dielectric constants. When the incident wavelength satisfies certain conditions, these thin films will function as a special Bragg optical grating, reflecting the incident light. Compared with metallic coatings, higher reflectance could be obtained using dielectric coating and therefore are more recommendable for applications requiring ultra-high reflectance. Another advantage is that dielectric mirrors are more durable and resistant to scratching and wiping than metallic mirrors.

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specification

Material	CorningUV-gradeFusedSilica	Diameter	12.7mm，25.4mm，50.8mm
Thickness	3mm,6mm,12mm	SurfaceQuality	10/5S/D
Flatness	λ/10	Coating	400-750nm,750-1100nm,1280-1600nm
AOI	0-45°	Customization	available

Product List of UV Fused Silica Dielectric Broadband Mirrors

Code	Diameter	Thickness	Surface Quality	Flatness	Coating	AOI	Unit Price
121-001	12.7mm	3.0mm	10/5 S/D	λ/10	400-750nm	0-45°	$30.5
121-002	12.7mm	3.0mm	10/5 S/D	λ/10	750-1100nm	0-45°	$33.5
121-003	12.7mm	3.0mm	10/5 S/D	λ/10	1280-1600nm	0-45°	$38.0
121-004	25.4mm	6.0mm	10/5 S/D	λ/10	400-750nm	0-45°	$50.0
121-005	25.4mm	6.0mm	10/5 S/D	λ/10	750-1100nm	0-45°	$53.0
121-006	25.4mm	6.0mm	10/5 S/D	λ/10	1280-1600nm	0-45°	$57.5
121-007	50.8mm	12.0mm	10/5 S/D	λ/10	400-750nm	0-45°	$118.0
121-008	50.8mm	12.0mm	10/5 S/D	λ/10	750-1100nm	0-45°	$124.5
121-009	50.8mm	12.0mm	10/5 S/D	λ/10	1280-1600nm	0-45°	$130.5

N-BK7 Metallic Mirrors



- Off-the-shelf mirrors available
- Coating options: Enhanced Al, Protective Ag and Protective Au
- Flatness λ/10 and λ/4 options available

Shalom EO's N-BK7 Metallic Mirrors consist of N-BK7 substrates and Enhanced Al/Protective Ag /Protective Au metallic coatings. Both stocked and custom versions are available.

N-BK7 is one of the most common materials for optical components available in large amounts, featuring low bubble/inclusion content, and decent mechanical/chemical endurance. Compared with UV Fused Silica mirrors, N-BK7 mirrors are less expensive.

Metallic coated mirrors feature a wide reflective spectral range, low cost, and are non-sensitive to the incidence angle and polarization state. Compared with dielectric coated mirrors, however, metal mirrors have lower reflectance and laser damage threshold, therefore metallic coated mirrors are the economical option for applications requiring a wide rejection range and less strict reflectance standards.

Three metal materials are utilized to coat the mirror substrates: Aluminum (Al) is the most prevalent metal for manufacturing reflection coating, it features high reflectance from UV to NIR spectrum, and is price-competitive. Silver (Ag) 's high-reflection zone locates at visible-to-NIR, and its reflection rate is higher than aluminum, however, sliver under exposure to air suffers from oxidation, which leads to blackening and degradation in performance and strength. Gold (Au) exhibits high reflectance from NIR to Far Infrared regions and is more consistent than the other two metals. The drawback is higher cost and the soft characteristic.

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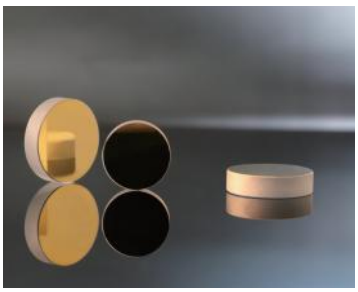
specification

Material	N-BK7	Diameter	12.7mm，25.4mm，50.8mm
Thickness	3mm,6mm,12mm	Surface Quality	10/5 S/D
Flatness	λ/10, λ/4	Coating	Enhanced Al, Protective Ag, and Protective Au

Product List of N-BK7 Metallic Mirrors

Code	Diameter	Thickness	Surface Quality	Flatness	Coating	Unit Price
123-001	12.7mm	3.0mm	20/10 S/D	λ/10	Enhanced Al	$17.0
123-002	12.7mm	3.0mm	40/20 S/D	λ/4	Enhanced Al	$14.0
123-003	12.7mm	3.0mm	20/10 S/D	λ/10	Protective Ag	$17.0
123-004	12.7mm	3.0mm	40/20 S/D	λ/4	Protective Ag	$14.0
123-005	12.7mm	3.0mm	20/10 S/D	λ/10	Protective Au	$23.0
123-006	12.7mm	3.0mm	40/20 S/D	λ/4	Protective Au	$18.0
123-007	25.4mm	6.0mm	20/10 S/D	λ/10	Enhanced Al	$25.0
123-008	25.4mm	6.0mm	40/20 S/D	λ/4	Enhanced Al	$22.0
123-009	25.4mm	6.0mm	20/10 S/D	λ/10	Protective Ag	$32.0
123-010	25.4mm	6.0mm	40/20 S/D	λ/4	Protective Ag	$24.0
123-011	25.4mm	6.0mm	20/10 S/D	λ/10	Protective Au	$38.0
123-012	25.4mm	6.0mm	40/20 S/D	λ/4	Protective Au	$30.0
123-013	50.8mm	12.0mm	20/10 S/D	λ/10	Enhanced Al	$64.0
123-014	50.8mm	12.0mm	40/20 S/D	λ/4	Enhanced Al	$48.0
123-015	50.8mm	12.0mm	20/10 S/D	λ/10	Protective Ag	$64.0
123-016	50.8mm	12.0mm	40/20 S/D	λ/4	Protective Ag	$48.0
123-017	50.8mm	12.0mm	20/10 S/D	λ/10	Protective Au	$94.0
123-018	50.8mm	12.0mm	40/20 S/D	λ/4	Protective Au	$75.0

UV Fused Silica Metallic Mirrors



- Off-the-shelf mirrors available
- Made of Corning UV grade Fused Silica
- Coating options: Enhanced Al, Protective Ag and Protective Au
- Flatness option： λ/10 and λ/4

Shalom EO's UV Fused Silica Metallic Mirrors consist of UV Fused Silica substrates, and Enhanced Al/Protective Ag /Protective Au metallic coatings. Both stocked and custom versions are available.
The UV Fused Silica used for manufacturing our mirror substrates is sourced from Corning. UV Fused Silica is an amorphous glass material fabricated using SiO2 with few inclusions. UV Fused Silica is known for its superior optical properties, in addition to great mechanical strength and low thermal expansion.

Metallic coated mirrors feature a wide reflective spectral range, low cost, and are non-sensitive to the incidence angle and polarization state. Compared with dielectric coated mirrors, however, metal mirrors have lower reflectance and laser damage threshold, therefore metallic coated mirrors are the economical option for applications requiring a wide rejection range and less strict reflectance standards.

Three metal materials are utilized to coat the mirror substrates: Aluminum (Al) is the most prevalent metal for manufacturing reflection coating, it features high reflectance from UV to NIR spectrum, and is price-competitive. Silver (Ag) 's high-reflection zone locates at visible-to-NIR, and its reflection rate is higher than aluminum, however, sliver under exposure to air suffers from oxidation, which leads to blackening and degradation in performance and strength. Gold (Au) exhibits high reflectance from NIR to Far Infrared regions and is more consistent than the other two metals. The drawback is higher cost and the soft characteristic.

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specification

Material	Corning UV-grade Fused Silica	Diameter	12.7mm，25.4mm，50.8mm
Thickness	3mm,6mm,12mm	Coating	Enhanced Al, Protective Ag, and Protective Au
Flatness	λ/10, λ/4	Customization	available

Product List of UV Fused Silica Metallic Mirrors

Code	Diameter	Thickness	Surface Quality	Flatness	Coating	Unit Price
124-001	12.7mm	3.0mm	20/10 S/D	λ/10	Enhanced Al	$22.5
124-002	12.7mm	3.0mm	40/20 S/D	λ/4	Enhanced Al	$18.0
124-003	12.7mm	3.0mm	20/10 S/D	λ/10	Protective Ag	$22.5
124-004	12.7mm	3.0mm	40/20 S/D	λ/4	Protective Ag	$18.0
124-005	12.7mm	3.0mm	20/10 S/D	λ/10	Protective Au	$29.0
124-006	12.7mm	3.0mm	40/20 S/D	λ/4	Protective Au	$22.5
124-007	25.4mm	6.0mm	20/10 S/D	λ/10	Enhanced Al	$32.0
124-008	25.4mm	6.0mm	40/20 S/D	λ/4	Enhanced Al	$29.0
124-009	25.4mm	6.0mm	20/10 S/D	λ/10	Protective Ag	$38.0
124-010	25.4mm	6.0mm	40/20 S/D	λ/4	Protective Ag	$29.0
124-011	25.4mm	6.0mm	20/10 S/D	λ/10	Protective Au	$43.0
124-012	25.4mm	6.0mm	40/20 S/D	λ/4	Protective Au	$35.0
124-013	50.8mm	12.0mm	20/10 S/D	λ/10	Enhanced Al	$78.5
124-014	50.8mm	12.0mm	40/20 S/D	λ/4	Enhanced Al	$60.5
124-015	50.8mm	12.0mm	20/10 S/D	λ/10	Protective Ag	$78.5
124-016	50.8mm	12.0mm	40/20 S/D	λ/4	Protective Ag	$60.5
124-017	50.8mm	12.0mm	20/10 S/D	λ/10	Protective Au	$100.0
124-018	50.8mm	12.0mm	40/20 S/D	λ/4	Protective Au	$83.5

Femtoline Low GDD Mirrors



- Stocked and custom mirrors are available
- Made of Corning UV-grade Fused Silica or other custom materials
- Low GDD and high damage threshold
- High Flatness λ/10, High SQ:10/5 S/D
- Reflection Band： 400nm, 532nm, 800nm, 808nm, 760-840nm,1030nm, 1000-1060nm, 1064nm or custom

Shalom EO's Femtoline Low GDD Mirrors are designed to provide high reflectance without additional temporal dispersion around a narrow bandwidth of central wavelength for femtoline lasers. The cutting-edge low GDD (Group Delay Dispersion) coating techniques of the mirrors help to minimize phase distortion and maintain the beam profile of the femtosecond pulses during light propagation. The substrates are made from UV Fused Silica, an excellent low-inclusion glass material with superior optical properties, mechanical strength, and low thermal expansion.
Compared with enhanced-ultrafast silver mirrors, low GDD mirrors utilize dielectric coatings which havea lower GDD, higher reflection coefficient, and higher damage threshold (300mJ @800nm,100fs), thus exhibiting exceptional performance for high-power femtosecond laser applications. However, low GDD mirrors are engineered to operate within a narrower wavelength range than ultrafast-enhanced silver mirrors.

Hangzhou Shalom EO offers stocked Femtoline Low GDD mirrors with high reflection in the following wavebands or wavelengths: 400nm, 532nm, 800nm, 808nm, 760-840nm, 1030nm, 1000-1060nm, 1064nm, at incident angles of 0 degrees and 45 degrees. Corning UV fused silica 7980 0F are selected as the substrate materials to ensure reliable optical properties of the mirrors. Custom GDD mirrors with other reflection wavebands are also accessible upon request.

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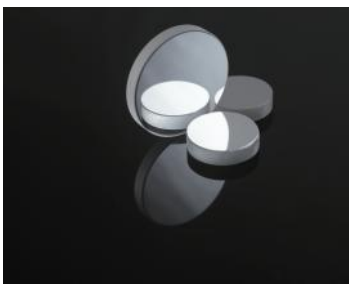
specification

Material	Corning UV-grade Fused Silica	Reflection Band	760-840nm,1000-1060nm, or custom
Diameter	12.7mm，25.4mm，50.8mm	Thickness	3mm,6mm,12mm
R,(S+P)/2	99.50%	AOI	0°, 45°
Surface Quality	10/5 S/D	Customization	available

Product List of Femtoline Low GDD Mirrors

Code	Wavelength	Diameter	Thickness	R,(S+P)/2	AOI	Unit Price
125-013	400nm	25.4mm	6.35mm	/	0°	60.5
125-014	400nm	25.4mm	6.35mm	/	45°	60.5
125-015	532nm	25.4mm	6.35mm	/	0°	60.5
125-016	532nm	25.4mm	6.35mm	/	45°	60.5
125-017	800nm	25.4mm	6.35mm	/	0°	60.5
125-018	800nm	25.4mm	6.35mm	/	45°	60.5
125-019	808nm	25.4mm	6.35mm	/	0°	60.5
125-020	808nm	25.4mm	6.35mm	/	45°	60.5
125-001	760-840nm	12.7mm	3.0mm	0.995	0°	45.5
125-002	760-840nm	25.4mm	6.0mm	0.995	0°	60.5
125-003	760-840nm	50.8mm	12.0mm	0.995	0°	136.5
125-004	760-840nm	12.7mm	3.0mm	0.995	45°	45.5
125-005	760-840nm	25.4mm	6.0mm	0.995	45°	60.5
125-006	760-840nm	50.8mm	12.0mm	0.995	45°	136.5
125-021	1030nm	25.4mm	6.35mm	/	0°	60.5
125-022	1030nm	25.4mm	6.35mm	/	45°	60.5
125-007	1000-1060nm	12.7mm	3.0mm	0.995	0°	45.5
125-008	1000-1060nm	25.4mm	6.0mm	0.995	0°	60.5
125-009	1000-1060nm	50.8mm	12.0mm	0.995	0°	136.5
125-010	1000-1060nm	12.7mm	3.0mm	0.995	45°	45.5
125-011	1000-1060nm	25.4mm	6.0mm	0.995	45°	60.5
125-012	1000-1060nm	50.8mm	12.0mm	0.995	45°	136.5
125-023	1064	25.4mm	6.35mm	/	0°	60.5
125-024	1064	25.4mm	6.35mm	/	45°	60.5

Ultrafast-Enhanced Silver Mirrors



- Stocked and Custom Mirrors Available
- Made of Corning UV grade Fused Silica
- High Reflectance at 600-1000nm
- Low GDD
- High flatness and Excellent Surface Quality

Ultrafast Enhanced Silver Mirrors incorporate silver coating enhanced with dielectric coating contributing to an increased reflectance between 600-1000nm and low GDD. The 600-1000nm reflection bandwidth is ideal for Ti: Sapphire lasers. The substrates are made from UV Fused Silica, an excellent low-inclusion glass material with superior optical properties, mechanical strength, and low thermal expansion. Compared with our Low GDD Femtoline Mirrors, the ultrafast enhanced silver mirrors can accommodate a wider reflective wavelength range but have a higher GDD and minor LIDT.

Hangzhou Shalom EO offers stocked and custom ultrafast-enhanced silver mirrors with low GDD, high flatness, and precision. Ultrafast-Enhanced Silver Mirrors are a cost-effective alternative to guarantee that ultrashort optical pulses sustain their peak power and are free from the effects of widening that are present in conventional metallic or dielectric mirrors.

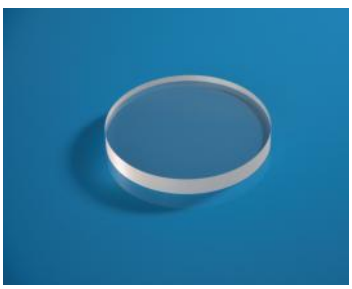
specification

Material	C7980-0F	Diameter	12.7mm，25.4mm，50.8mm
Surface Quality	20/10 S/D	Coating	Enhanced silver
reflection bandwidth	600-1000nm	Customization	available

Product List of Ultrafast-Enhanced Silver Mirrors

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Coating	Unit Price
126-001	C7980-0F	12.7mm	3mm	20/10 S/D	λ/10	Enhanced silver	$30.5
126-002	C7980-0F	25.4mm	6mm	20/10 S/D	λ/10	Enhanced silver	$50.0
126-003	C7980-0F	50.8mm	12mm	20/10 S/D	λ/10	Enhanced silver	$121.5

UV Fused Silica Mirror Blanks



- Made of UV Fused Silica
- Low thermal expansion
- High mechanical strength
- Stocked and Custom Products
- Excellent as windows or mirror substrates

Optical windows are used to transmit light and protect work areas or sensitive components from the outside environment. Optical windows use substrates, coatings, or a combination of the two to transmit specific wavelengths or ranges of wavelengths. Uncoated UV Fused Silica windows could also be used as substrates or blanks of mirrors.

For manufacturing optical windows, UV Fused Silica has the advantage of high transmission in the UV to NIR wavelength range. When selected to manufacture mirror substrates, the optical properties are of little importance, since the substrate material has no impact on the mirror's optical properties, the virtues of UV Fused Silica include low inclusion of impure substance, low thermal expansion, and high mechanical strength.

Hangzhou Shalom EO is a custom and off-the-shelf supplier, we provide uncoated versions of UV fused silica windows, which are befitting to be used as substrates or blanks for mirrors. The stocked UV fused silica windows or mirror blanks are made from Corning 7980 series fused silica glass, including Lambda/4 flatness modules and lambda/10 modules, Lambda/4 flatness are low cost and suitable for most kinds of optical applications, and the Lambda/10 flatness modules are suitable for laser system and other high demanding applications.

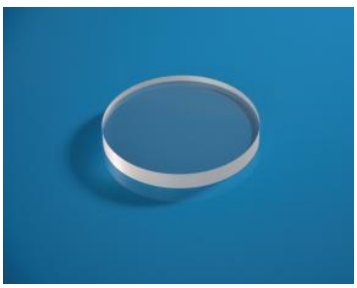
Specifications:

Material	Corning UV-grade Fused Silica	Diameter	12.7mm，25.4mm，50.8mm
Thickness	2mm,3mm,4mm,6mm,12mm	Surface Quality	10/5 S/D
Flatness	λ/10, λ/4	Parallelism	10 arcsec

Product List of UV Fused Silica Mirror Blanks

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
134-001	C7980-0F	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$27.0
133-001	UV Fused Silica	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$20.0
134-005	C7980-0F	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$27.0
133-005	UV Fused Silica	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$20.0
133-009	UV Fused Silica	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
134-009	C7980-0F	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
133-013	UV Fused Silica	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
134-013	C7980-0F	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
133-017	UV Fused Silica	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
134-017	C7980-0F	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
133-021	UV Fused Silica	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
134-021	C7980-0F	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
133-025	UV Fused Silica	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$60.0
134-025	C7980-0F	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$98.0
133-029	UV Fused Silica	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$75.0
122-017	633nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	HeNe	$50.0
122-018	633nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	HeNe	$118.0
122-019	670nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	LD	$30.5
122-020	670nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	LD	$50.0
122-021	670nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	LD	$118.0
122-022	694nm	12.7mm	3.0mm	λ/10	400-750nm	0-45°	Ruby	$30.5
122-023	694nm	25.4mm	6.0mm	λ/10	400-750nm	0-45°	Ruby	$50.0
122-024	694nm	50.8mm	12.0mm	λ/10	400-750nm	0-45°	Ruby	$118.0
122-025	780nm	12.7mm	3.0mm	λ/10	750-1100nm	0-45°	LD	$33.5
122-026	780nm	25.4mm	6.0mm	λ/10	750-1100nm	0-45°	LD	$53.0
122-027	780nm	50.8mm	12.0mm	λ/10	750-1100nm	0-45°	LD	$124.5
122-028	760-840nm	12.7mm	3.0mm	λ/10	760-840nm Low GDD	0-45°	Ti:Sa 1H	$45.5
122-029	760-840nm	25.4mm	6.0mm	λ/10	760-840nm Low GDD	0-45°	Ti:Sa 1H	$60.5

N-BK7 Mirror Blanks



- Made of N-BK7
- High scratch-resistance
- Stable chemical properties
- Stocked and Custom Products
- Excellent as windows or mirror substrates

Optical windows are used to transmit light and protect work areas or sensitive components from the outside environment. Optical windows use substrates, coatings, or a combination of the two to transmit specific wavelengths or ranges of wavelengths. Uncoated N-BK7 windows could also be used as substrates or blanks of mirrors.

N-BK7 features excellent transmission from visible to NIR spectrum, low inclusion of bubbles and impure substances, and ease of manufacturing and machining. Therefore it is an excellent choice for transmission optical components. As mirror substrates, N-BK7 is also advantageous in terms of fine mechanical properties resistance to scratches, and stable chemical properties.

Shalom EO's stocked N-BK7 windows or mirror blanks including the Lambda/4 flatness modules and lambda/10 modules, while Lambda/4 flatness is low cost and suitable for most kinds of optical applications, and the Lambda/10 flatness modules are suitable for laser system and other high demanding applications.

Specifications:

Material	N-BK7	Diameter	12.7mm，25.4mm，50.8mm
Thickness	2mm,3mm,4mm,6mm,12mm	Surface Quality	10/5 S/D
Flatness	λ/10, λ/4	Parallelism	10 arcsec

Product List of N-BK7 Mirror Blanks

Code	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
132-001	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$15.0
131-001	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$9.0
132-005	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$15.0
131-005	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$9.0
132-009	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
131-009	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
132-013	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
131-013	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
132-017	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
131-017	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
132-021	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
131-021	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
132-025	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$55.0
131-025	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$45.5
131-029	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$48.5

Optical Windows



An Optical Window is a transparent optical element that allows light to pass through while protecting enclosed areas from environmental elements such as dust, moisture, or pressure. These windows are often used in various optical instruments, sensors, cameras, and lasers. The fundamental purpose of an optical window is to provide a barrier between the external environment and sensitive optical components inside an optical system, while still allowing light to pass through with minimal distortion or attenuation. In addition to protecting optical components, optical windows might also serve other functions such as reducing reflections, improving contrast, or providing a sealed enclosure.

Hangzhou Shalom EO is an expert supplier of custom and off-the-shelf optical windows, this catalog features Shalom EO's UV/VIS/IR optical windows, high-precision laser windows and ultra-thin high flatness optical windows for femtosecond lasers. A vast selection of optical windows are accessible. Apart from the standardized sizes, we are capable of achieving a minimum size down to 0.5mm and a minimum thickness down to 0.03mm.

λ/4 UV Fused Silica Windows



- Off-the-shelf optical windows
- Made of Corning UV fused silica
- Surface quality 10/5 S/D and parallelism 10″
- Coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm or custom

Shalom EO offers off-the-shelf and custom λ/4 UV Fused Silica Windows, crafted from Corning's UV fused silica, with multiple coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm, or customized coatings. Regarding the off-the-shelf products, sizes are standardized which benefits OEM. We implement a meticulous precision polishing procedure to achieve a surface quality of 10/5 S/D, contributing to exceptional transmission in the UV spectrum. Our λ/4 UV Fused Silica windows ensure accurate optical path management and readiness for immediate integration, empowering reliable support across various scientific and industrial pursuits.

Specifications:

Material	Corning UV-grade Fused Silica	Coating	Uncoated, 400-700nm/700-1100nm/1100-1650nm AR
Thickness	2mm,3mm,4mm,6mm,12mm	Surface Quality	10/5 S/D
Parallelism	10 arcsec	Diameter	12.7mm，25.4mm，50.8mm

Product List of λ/4 UV Fused Silica Windows

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
133-001	UV Fused Silica	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$20.0
133-002	UV Fused Silica	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$27.0
133-003	UV Fused Silica	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$27.0
133-004	UV Fused Silica	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$27.0
133-005	UV Fused Silica	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$20.0

Product List of λ/4 UV Fused Silica Windows

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
133-009	UV Fused Silica	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
133-010	UV Fused Silica	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$39.0
133-011	UV Fused Silica	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$39.0
133-012	UV Fused Silica	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$39.0
133-013	UV Fused Silica	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
133-014	UV Fused Silica	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$39.0
133-015	UV Fused Silica	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$39.0
133-016	UV Fused Silica	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$39.0
133-017	UV Fused Silica	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
133-018	UV Fused Silica	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$39.0
133-019	UV Fused Silica	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$39.0
133-020	UV Fused Silica	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$39.0
133-021	UV Fused Silica	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$30.0
133-022	UV Fused Silica	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$39.0
133-023	UV Fused Silica	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$39.0
133-024	UV Fused Silica	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$39.0
133-025	UV Fused Silica	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$60.0
133-026	UV Fused Silica	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$90.0
133-027	UV Fused Silica	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$90.0
133-028	UV Fused Silica	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$90.0
133-029	UV Fused Silica	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$75.0
133-030	UV Fused Silica	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$106.0
133-031	UV Fused Silica	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$106.0
133-032	UV Fused Silica	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$106.0

λ/4 N-BK7 Windows



- Stocked optical windows available
- Surface quality 10/5 S/D and parallelism 10"
- Coating options: uncoated, 400-700 nm, 700-1100 nm, 1100-1650 nm or custom
- Maximum diameter: 300mm

Shalom EO offers stock and custom λ/4 N-BK7 Windows with multiple coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm, or customizable coatings. Regarding the off-the-shelf products, sizes are standardized which benefits OEM, whilst a maximum diameter of 300mm is procurable in custom versions. These N-BK7 windows, featuring an exceptional surface quality of 10/5 S/D accredited to our tight-geometric control measures, optical excellence and robustness are competent at various tasks.

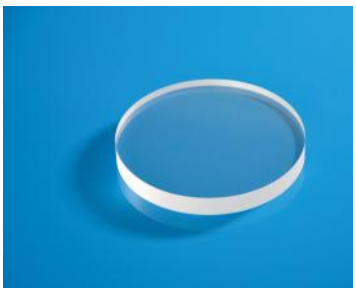
Specifications:

Diameter	12.7mm，25.4mm，50.8mm	Thickness	2mm,3mm,4mm,6mm,12mm
Surface Quality	10/5 S/D	Flatness	λ/4
Parallelism	10 arcsec	Coating	Uncoated, 400-700nm/700-1100nm/1100-1650nm AR

Product List of λ/4 N-BK7 Windows

Code	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
131-001	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$9.0
131-002	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$13.5
131-003	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$13.5
131-004	12.7mm	2.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$13.5
131-005	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$9.0
131-006	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$13.5
131-007	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$13.5
131-008	12.7mm	3.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$13.5
131-009	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
131-010	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$26.0
131-011	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$26.0
131-012	25.4mm	2.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$26.0
131-013	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
131-014	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$26.0
131-015	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$26.0
131-016	25.4mm	3.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$26.0
131-017	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
131-018	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$26.0
131-019	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$26.0
131-020	25.4mm	4.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$26.0
131-021	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$18.0
131-022	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$26.0
131-023	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$26.0
131-024	25.4mm	6.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$26.0
131-025	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$45.5
131-026	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$53.0
131-027	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$53.0
131-028	50.8mm	4.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$53.0
131-029	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	Uncoated	$48.5
131-030	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	400-700nm AR	$60.0
131-031	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	700-1100nm AR	$60.0
131-032	50.8mm	12.0mm	10/5 S/D	λ/4	10 arcsec	1100-1650nm AR	$60.0

λ/10 N-BK7 Windows



- Stocked optical windows available
- High flatness λ/10
- Surface quality 10/5 S/D
- Coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm or custom

Shalom EO offers stock and custom high-precision λ/10 N-BK7 Windows with multiple coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm, or custom coatings. Laser-line windows are designed in particular to transmit the laser wavelengths while minimizing losses due to absorption or scattering, deflecting harmful laser beams. Our optical windows are produced using SCHOTT's N-bk7 glass, which is a ROHs-compliant borosilicate glass material renowned for its optical excellence and good comprehensive properties. The exceptional precision (λ/10 flatness and 10/5 S/D surface quality) and the excellent optical, thermal, and mechanical properties of the N-bk7 substrates render our λ/10 n-bk7 windows competent when being utilized as laser-line windows. Besides, Our λ/10 n-bk7 windows also find versatile utilities in other application fields when designated as plain optical windows.

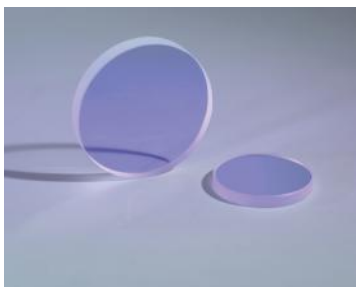
Specifications:

Material	N-BK7	Surface Quality	10/5 S/D
Parallelism	10 arcsec	Flatness	λ/10
Diameter	12.7mm，25.4mm，50.8mm	Coating	Uncoated, 400-700nm/700-1100nm/1100-1650nm AR

Product List of λ/10 N-BK7 Windows

Code	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
132-001	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$15.0
132-002	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$23.0
132-003	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$23.0
132-004	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$23.0
132-005	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$15.0
132-006	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$23.0
132-007	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$23.0
132-008	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$23.0
132-009	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
132-010	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$38.0
132-011	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$38.0
132-012	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$38.0
132-013	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
132-014	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$38.0
132-015	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$38.0
132-016	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$38.0
132-017	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
132-018	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$38.0
132-019	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$38.0
132-020	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$38.0
132-021	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
132-022	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$38.0
132-023	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$38.0
132-024	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$38.0
132-025	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$55.0
132-026	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$98.0
132-027	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$98.0
132-028	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$98.0

λ/10 UV Fused Silica Windows



- Off-the-shelf optical windows
- Made of Corning UV fused silica
- 10/5 S/D Surface Quality
- High flatness (λ/10) and excellent parallelism
- Coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm or custom

Hangzhou Shalom EO offers stock and custom λ/10 UV fused silica Windows with multiple coating options: uncoated, 400-700nm, 700-1100nm, 1100-1650nm, or customized coatings. Laser-line windows are designed in particular to transmit the laser wavelengths while minimizing losses. Our UVFS windows are crafted from Corning's UV Fused Silica, a prevalent optical material that stands out for its exceptional transmittance in the UV spectrum, low thermal expansion, and superior holistic characteristics. The λ/10 UV fused silica Windows boasting high flatness and precise manufacturing are an excellent option as laser-line windows to obtain optimized transmission. Whilst the intrinsic merits of the UVFS substrates and coatings ensure durabilities and minimum scattering. Besides, Our UV-fused silica Windows also find versatile utilities in other application fields when designated as plain optical windows.

Specifications:

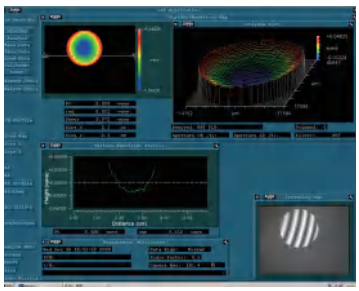
Material	Corning UV-grade Fused Silica	Diameter	12.7mm，25.4mm，50.8mm
Thickness	1-12mm	Surface Quality	10/5 S/D
Flatness	λ/10	Parallelism	10 arcsec
Coating	Uncoated, 400-700nm/700-1100nm/1100-1650nm AR	Customization	available

Product List of λ/10 UV Fused Silica Windows

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
134-001	C7980-0F	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$27.0
134-002	C7980-0F	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$35.0
134-003	C7980-0F	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$35.0
134-004	C7980-0F	12.7mm	2.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$35.0
134-005	C7980-0F	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$27.0
134-006	C7980-0F	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$35.0
134-007	C7980-0F	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$35.0
134-008	C7980-0F	12.7mm	3.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$35.0
135-009A	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
135-009	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR Coating	$75.0
135-009B	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR Coating	$53.0
135-009C	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	53.0
134-009	C7980-0F	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
134-010	C7980-0F	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$53.0
134-011	C7980-0F	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$53.0
134-012	C7980-0F	25.4mm	2.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$53.0
134-013	C7980-0F	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
134-014	C7980-0F	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$53.0
134-015	C7980-0F	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$53.0
134-016	C7980-0F	25.4mm	3.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$53.0
134-017	C7980-0F	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
134-018	C7980-0F	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$53.0
134-019	C7980-0F	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$53.0
134-020	C7980-0F	25.4mm	4.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$53.0
134-021	C7980-0F	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$42.0
134-022	C7980-0F	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$53.0
134-023	C7980-0F	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$53.0
134-024	C7980-0F	25.4mm	6.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$53.0
134-025	C7980-0F	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$98.0
134-026	C7980-0F	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	400-700nm AR	$129.0
134-027	C7980-0F	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	700-1100nm AR	$129.0
134-028	C7980-0F	50.8mm	12.0mm	10/5 S/D	λ/10	10 arcsec	1100-1650nm AR	$129.0

High Precision Thin N-BK7, UV Fused Silica Windows





- Off-the-shelf and custom modules available
- Made of BK7, UVFS, or Quartz Crystals
- Minute thickness and high surface flatness
- Surface quality 10/5 S/D and parallelism 10"
- Minimum thickness: 0.03mm, minimum size: 0.5mm
- Uncoated mirror substrates and custom AR coating options available

Hangzhou Shalom EO has developed a double surface polishing method for the production of High Precision Thin Optical Windows or Substrates, where the surfaces of the windows or substrates are polished in one go, achieving accurate control of surface flatness while elevating the surface quality to 10/5 S/D. The high-precision thin windows manufactured in our factory are of outstanding functionalities that could meet the criteria for ultra-thin (0.1mm, 0.2mm) windows or substrates with high surface flatness (Lambda/10 or Lambda/4 @633nm), oriented for applications for precision optical systems such as Femtosecond lasers, whose market share is surging in recent years.

The double surface polishing method is a processing technique, where both of the two surfaces of optics complete their polishing procedure in one go. The optics are not put on pitch plates during the procedure, so that is no stress-releasing problem caused by bonding and detachment between the optics being polished and the carrier plate, which eliminates the variation of surface flatness of the window substrate to a significant extent.

High Precision Thin windows made from BK7, UV Fused Silica, and Quartz Crystals are available in Shalom EO, the windows feature superior surface quality of 10/5 Scratch/Dig, parallelism of 10 arcsec, with minimum thickness down to 0.03mm, diameter down to 0.5mm. N-BK7 is beneficial wavelengths from the Visible to IR spectrum (350-2000nm), and UV Fused Silica is recommendable for UV wavelengths due to low absorption in the UV range. Both of them are renowned optical glass materials with substantial mechanical strength and thermal stability and can endure operations under various conditions. Besides, windows made from Quartz Crystal are also provided.

The standard specifications of Thin BK7, UVFS, and Quartz Crystals Windows offered in Shalom EO include 12.7mmx0.2mm with λ/2 flatness, 12.7mmx1.0mm with λ/10 flatness, 25.4mmx0.2mm with λ/2 flatness and 25.4mmx1.0mm with λ/10 flatness, in addition to other custom dimensions. The windows could be configured with mounts for ease of handling, both uncoated window substrates and custom AR coatings are available.

Specifications:

Material	N-BK7, UVFS, Quartz	Coating	Uncoated, Custom AR Coating
Parallelism	10 arcsec	Flatness	λ/2, λ/10
Thickness	0.03mm minimum	Diameter	12.7mm, 25.4mm, or Custom (minimum 0.5mm)
Surface Quality	10/5 S/D		

Product List of High Precision Thin N-BK7, UV Fused Silica Windows

Code	Material	Diameter	Thickness	Surface Quality	Flatness	Parallelism	Coating	Unit Price
135-001	N-BK7	12.7mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$30.0
135-002	N-BK7	12.7mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$30.0
135-003	N-BK7	25.4mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$45.0
135-004	N-BK7	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$45.0
135-005	C7980-0F	12.7mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$38.0
135-006	C7980-0F	12.7mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$38.0
135-007	C7980-0F	25.4mm	0.2mm	10/5 S/D	λ/2	10 arcsec	Uncoated	$60.0
135-008	C7980-0F	25.4mm	1.0mm	10/5 S/D	λ/10	10 arcsec	Uncoated	$60.0

Sapphire Windows



- Exceptional mechanical hardness and chemical resistance
- High thermal durabilities and broad wavelength range from 200-5500nm
- Ideal for harsh conditions and high-power applications (e.g lasers, plasma chambers, pharmaceuticals, etc.)
- Blank substrates, AR-coated pieces, and precision windows are available
- Various dimensions, shapes, orientations, and precision standards
- Sapphire window kinds: Optical-grade Sapphire Windows, Protective Sapphire Laser Windows, Metalized Sapphire Windows, etc.

Sapphire Windows, featuring reliable mechanical/thermal/chemical robustness, large dielectric constants, and broad optical transmission from 150-5500 nm, are excellent as both optical windows and protective windows in application contexts of more stringent requirements and extreme conditions.

Shalom EO offers various kinds of stocked and custom Sapphire Windows. Shalom EO's sapphire windows are manufactured using KY-grown single crystal sapphire, endowing the material sapphires with high homogeneities, low inclusions, few striae, and large-dimension capabilities.

Regarding the stocked sapphire windows, the windows are uncoated, of circular or square shapes, with a wide selection of available diameters (or side lengths) up to 150mm and C-cut orientation. Most of the sapphire windows in our inventories are manufactured with 60/40 S/D surface qualities and 2 λ flatness, however, advanced versions with 40/20 S/D and λ/4 flatness are also procurable as stocks.

Regarding the custom sapphire windows, Large aperture sapphire windows with diameters up to 300mm are accessible, and surface qualities of 60/40, 40/20, 20/10 Scratch/Dig are optional. We are also capable of providing high-precision ultra-thin sapphire windows with a large diameter-to-thickness ratio. Blank sapphire substrates and windows coated single film MgF2 coatings and other AR coatings could also be furnished to increase transmission. Z-cut sapphire windows with the c-axis parallel to the optical axis to avoid birefringence in critical optical uses, and random-cut sapphire windows are both available. With state-of-the-art technologies, you can experience optical excellence with diverse range of sapphire window products: Optical Sapphire Windows (flat circular, flat rectangular, sapphire wedge windows, sapphire step windows), Protective Sapphire Laser Windows, sapphire windows for sight glass and packages of machine interiors, metalized sapphire windows with nickel, chrome, and gold films on the window edges.

Specifications:

Window Shape	Flat circular, flat square (Standard); or custom	Materials	Optical grade single crystal sapphire
Diameter/Side Length	Standard 2.5-150mm, Custom~300mm	Orientation	C-cut(Standard)/Random-cut/Custom
Aperture	>90%	Diameter Tolerance	+0.0/-0.1mm
Thickness Tolerance	+/-0.05mm(Standard), or custom	Flatness	2λ@633nm, λ/4@633nm
Surface Quality	Standard 60/40 S/D, 40/20 S/D, or Custom	Parallelism	30 arcsec
Coating Options	Uncoated, or Custom		

Product List of Sapphire Windows

Code	Types	Dimension	Orientation	Surface Quality	Flatness	Coating	Unit Price
153-001	Circular	Dia2.5x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$6.00
153-002	Circular	Dia3.2x1mm	C-cut	60/40 S/D	2λ	Uncoated	$6.50
153-003	Circular	Dia5.0x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$7.00
153-004	Circular	Dia5.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$7.00
153-005	Circular	Dia6.35x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$7.00
153-006	Circular	Dia6.35x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$7.50
153-007	Circular	Dia6.35x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$7.50
153-008	Circular	Dia7.5x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$8.50
153-009	Circular	Dia9.5x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$9.00
153-010	Circular	Dia10.0x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$9.50
153-011	Circular	Dia10.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$9.80
153-012	Circular	Dia12.5x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$10.00
153-013	Square	12.5x12.5x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$11.00
153-014	Circular	Dia12.7x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$8.00
153-015	Circular	Dia12.7x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$8.50
153-016	Circular	Dia12.7x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$9.00
153-017	Circular	Dia12.7x2.0mm	C-cut	40/20 S/D	λ/4	Uncoated	Inquire
153-018	Circular	Dia12.7x3.18mm	C-cut	60/40 S/D	2λ	Uncoated	$12.00
153-019	Circular	Dia13.0x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$10.00
153-020	Circular	Dia15.0x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$10.50
153-021	Circular	Dia15.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$11.00
153-022	Circular	Dia15.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$11.00
153-023	Circular	Dia17.25x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$12.50
153-024	Circular	Dia20.0x0.5mm	C-cut	60/40 S/D	2λ	Unocated	$14.50
153-025	Circular	Dia20.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$15.00
153-026	Circular	Dia20.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$16.00
153-027	Circular	Dia22.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$18.50
153-028	Cicurlar	Dia23.75x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$19.00
153-029	Circular	Dia25.0x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$19.50
153-030	Circular	Dia25.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$20.00
153-031	Circular	Dia25.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$20.5
153-032	Circular	Dia25.4x0.5mm	C-cut	60/40 S/D	2λ	Uncoated	$20.00
153-033	Circular	Dia25.4x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$20.50
153-034	Square	25.4x25.4x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$26.00
153-035	Circular	Dia25.4x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$21.00
153-036	Circular	Dia25.4x2.0mm	C-cut	40/20 S/D	λ/4	Uncoated	Inquire
153-037	Circular	Dia30.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$30.00
153-038	Circualr	Dia31.75x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$31.00
153-039	Circualr	Dia35.0x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$30.00
153-040	Circualr	Dia38.1x1.0mm	C-cut	60/40 S/D	2λ	Uncoated	$30.00
153-041	Circular	Dia40.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$39.00
153-042	Circular	Dia50.8x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$85.00
153-043	Circular	Dia50.8x2.0mm	C-cut	40/20 S/D	λ/4	Uncoated	Inquire
153-044	Circular	Dia50.8x3.15mm	C-cut	60/40 S/D	2λ	Uncoated	$86.00
153-045	Circular	Dia63.5x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$100.00
153-046	Circualr	Dia75.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$120
153-047	Circualr	Dia100.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$150.00
153-048	Circualr	Dia125.0x2.0mm	C-cut	60/40 S/D	2λ	Uncoated	$250.00
153-049	Circular	Dia150.0x3.0mm	C-cut	60/40 S/D	2λ	Uncoated	$300.00

Sapphire Domes



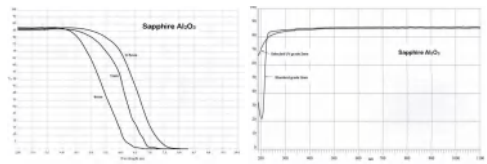
- Diameters ranging from 10mm to 380mm
- Excellent transmission from UV to MWIR
- Exceptional surface hardness and chemical resistance
- Ideal for defense and aerospace application

Sapphire domes are protective covers or enclosures made from sapphire crystal. Sapphire is a hard and scratch-resistant material that offers excellent optical properties with its excellent transmission extending from UV to MWIR spectral region, making it suitable for various applications where robustness and transmission are essential. The wide transmission wavelength range of sapphire domes makes them desirable for multi-spectral operation and their incomparable mechanical strength excels in high-speed context.

Hangzhou Shalom EO offers custom sapphire domes. Our sapphire domes are optimized for utilization in aircraft, Industrial, missile, and scientific experiment applications to be incorporated into sensors, IR cameras, high-pressure chambers, etc. providing protection against high-speed impacts, extreme temperatures, and abrasive particles encountered, while maintaining a transparent and robust barrier.

Curves:

1.Transmission of Sapphire at Infrared Wavelength Range (no coating)
2.Transmission of Sapphire at UV Wavelength Range (no coating)



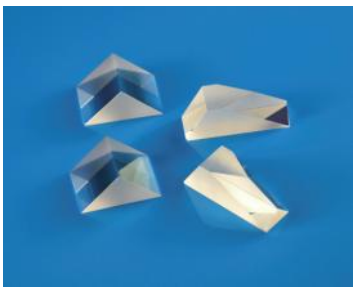
Specifications:

Materials	Optical grade sapphire crystals (Al2O3)	Diameter Range	10~ 380mm
Thickness Tolerance	+/-0.2mm (Optional:+/-0.1mm and +/-0.05mm)	Surface Quality	60/40 to 40/20 S/D
Fringes (N)	customized	Irregularity (delta N)	customized
Chamfer	0.1~0.3mmx45degree		

Physical and Optical Properties:

Transmission Range	0.17 to 5.5μm	Refractive Index	No 1.75449; Ne 1.74663 at 1.06μm (1)
Reflection Loss	14% at 1.06μm	Absorption Coefficient	0.3 x 10-3 cm-1 at 2.4μm (2)
Reststrahlen Peak	13.5μm	dn/dT	13.1 x 10-6 at 0.546μm (3)
dn/dμ = 0	1.5μm	Density	3.97 g/cc
Melting Point	2040°C	Thermal Conductivity	27.21 W m-1 K-1 at 300K
Thermal Expansion	5.6 (para) & 5.0 (perp) x 10-6 /K *	Hardness	Knoop 2000 with 2000gindenter
Specific Heat Capacity	763 J Kg-1 K-1 at 293K (4)	Dielectric Constant	11.5 (para) 9.4 (perp) at 1MHz
Youngs Modulus (E)	335 GPa	Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa	Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	300 MPa (45,000 psi)	Poisson Ratio	0.25
Solubility	98 x 10-6 g/100g water	Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c		

Optical Prisms



Optical Prisms are elements made from transparent materials with flat, polished faces that are processed into various geometric shapes to reflect, refract light, or manipulate the light path of the incident light. For instance, The most renowned prisms are the triangular prisms, which split a white light source into its constituent spectral colors based on the principle of chromatic dispersion. Prisms can also be harnessed to commit diverse optical functions, including light deviation, rotation/inversion of the image, beam steering/aligning, etc.

Among the merits of optical prisms, the one worth noting most is a simple prism can be viewed as a good substation for multiple mirrors, reducing the potential for alignment errors, and promoting precision while making the optical set more compact.

In general, Optical prisms can be divided into two categories, dispersive and reflective.

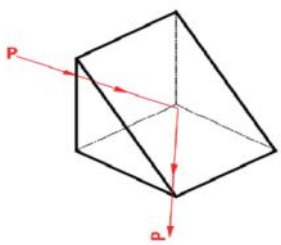
A dispersive prism breaks an incident white light into chromatic components since the lights of different colors have different refractive indexes. Common dispersive prisms include a triangular prism, such as an equilateral prism.

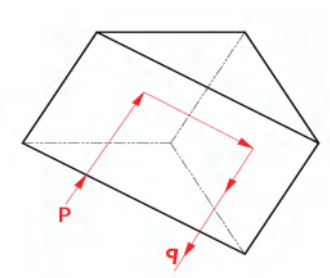
Reflective prisms are utilized to reflect light, flip, invert, rotate, deviate, or displace the light beam leveraging total internal reflection. Common reflective prisms include Right Angle Prisms, Wedge Prisms, Roof Prisms, Dove Prisms, Corner-cube Retroreflectors, Porro Prisms, etc.

Hangzhou Shalom EO offers various kinds of stock and custom Optical Prisms, including Right Angle Prisms, Corner Cube Retroreflectors, Wedge Prisms, Brewster Angle Prisms, Equilateral Prisms, in addition to Penta Prisms, Dove Prisms, Roof Prisms, and Porro Prisms. Coating options include uncoated, MgF2 AR coating, Broadband AR coating, and laser line wavelength V-coating are all available. Shalom EO is a high-profile supplier of optical prisms, throughout the manufacturing procedure of the optical prisms, Shalom EO implements in-process adjustments and inspections, and proficient opticians that are competent for the labor-intensive and challenging work are hired to secure optimum qualities of the optical prisms.

Right Angle Prisms







- Substrate materials: N-BK7 or UV Fused Silica, N-SF11, CaF2, Ge, ZnSe
- For light path deviation of 90° or 180°
- Coating Options: Uncoated, BBAR-coating and V-coating options on the prism's hypotenuse or legs (the bandwidths custom-specified)
- High-precision prisms with λ/10 @632.8nm flatness
- Applications: periscopes or telescopes, binocular configurations, etc.
- Dimensions: legs 3-60mm, hypotenuse 4.24-84.85mm, or Custom

A Right-Angle Prism is a triangular block of glass with a 90-degree vertex angle and two orthogonal sides. Right-angle prisms are often used to redirect light at 90° or 180°. The deviation of the light path is done utilizing the principle of total internal reflection (TIR) at the interface of glass to air. As one selects a different

entrance side to project light onto the right-angle prism, the degree to which the light path departs will also change.

Right-angle prisms exhibit certain advantages when compared with other optical counterparts with similar functions. it's a great deal simpler to mount and bend from the outside than inclined mirrors in the concern of mechanical design, as well as in situations with high acoustic or inertial loads. Furthermore, the right-angle prisms can be utilized as a retroreflector, redirecting beams back in the direction that came from, as long as the acceptance angle constraints for TIR from the roof faces are not exceeded.

Regarding Shalom EO's Off-the-shelf Right-Angle Prisms, two substrate materials are available: N-BK7 or UV Fused Silica. The Dimensions are diversified, the lengths of the legs range from 3-60mm, while the length of the hypotenuse ranges from 4.24-84.85mm. Besides, these stocked right-angle prisms feature high precision with the surface flatness bridled tight to λ/10 @632.8nm. At the current time, the standard prisms in our storage are uncoated.

Hangzhou Shalom EO offers a series of Custom Right-angle Prisms made of N-BK7, UV Fused Silica, N-SF11, Calcium Fluoride (CaF2), Germanium (Ge), or Zinc Selenide (ZnSe), etc. We provide various anti-reflection coatings at the right angle prism's hypotenuse faces or perpendicular sides. Broadband AR coatings or Laserline V coatings with specified bandwidth at the right angle prisms ' hypotenuse faces or at prisms' legs to enhance transmission in the Ultraviolet, Visible, or Infrared spectrum are available. Besides, other specifications such as flatness, surface quality, etc. could all be tailored according to the customer's requirements, we are capable of providing prisms of high precision to prisms of commercial grades.

Shalom EO is an industrial-leading team with professional knowledge in the domain of optics and lasers, through stringent control of qualities and tolerances, and high-precision polishing techniques, Shalom EO's right angle prisms present minimized wavefront distortion, scattering, and other undesirable diffraction effects.

Specifications:

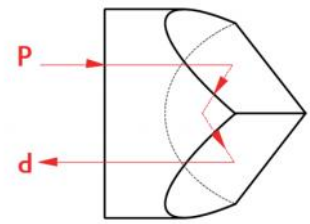
Material	N-BK7 or UV Fused Silica (Standard)	Dimension Tolerance	±0.1mm
Surface Quality	40/20 S/D	Clear Aperture	>90%
Surface Flatness	λ/10@632.8nm	Angular Tolerance	±3 arc minutes
Bevelling	0.2x45°	Coating	Uncoated or Custom

Product List of Right Angle Prism

Code	Material	Side Length	Thickness	Flatness	Coating	Unit Price
1401-001	N-BK7	3mmx3mmx4.24mm	3mm	λ/10@632.8nm	Uncoated	Inquire
1401-002	UV Fused Silica	3mmx3mmx4.24mm	3mm	λ/10@632.8nm	Uncoated	Inquire
1401-003	N-BK7	5mmx5mmx7.07mm	5mm	λ/10@632.8nm	Uncoated	Inquire
1401-004	UV Fused Silica	5mmx5mmx7.07mm	5mm	λ/10@632.8nm	Uncoated	Inquire
1401-005	N-BK7	10mmx10mmx14.14mm	10mm	λ/10@632.8nm	Uncoated	Inquire
1401-006	UV Fused Silica	10mmx10mmx14.14mm	10mm	λ/10@632.8nm	Uncoated	Inquire
1401-007	N-BK7	12.5mmx12.5mmx17.68mm	12.5mm	λ/10@632.8nm	Uncoated	Inquire
1401-008	UV Fused Silica	12.5mmx12.5mmx17.68mm	12.5mm	λ/10@632.8mm	Uncoated	Inquire
1401-009	N-BK7	15mmx15mmx21.21mm	15mm	λ/10@632.8nm	Uncoated	Inquire
1401-010	UV Fused Silica	15mmx15mmx21.21mm	15mm	λ/10@632.8nm	Uncoated	Inquire
1401-011	N-BK7	20mmx20mmx28.28mm	20mm	λ/10@632.8nm	Uncoated	Inquire
1401-012	UV Fused Silica	20mmx20mmx28.28mm	20mm	λ/10@632.8nm	Uncoated	Inquire
1401-013	N-BK7	25mmx25mmx35.36mm	25mm	λ/10@632.8nm	Uncoated	Inquire
1401-014	UV Fused Silica	25mmx25mmx35.36mm	25mm	λ/10@632.8nm	Uncoated	Inquire
1401-015	N-BK7	30mmx30mmx42.43mm	30mm	λ/10@632.8nm	Uncoated	Inquire
1401-016	UV Fused Silica	30mmx30mmx42.43mm	30mm	λ/10@632.8nm	Uncoated	Inquire
1401-017	N-BK7	40mmx40mmx56.57mm	40mm	λ/10@632.8nm	Uncoated	Inquire
1401-018	UV Fused Silica	40mmx40mmx56.57mm	40mm	λ/10@632.8nm	Uncoated	Inquire
1401-019	N-BK7	50mmx50mmx70.71mm	50mm	λ/10@632.8nm	Uncoated	Inquire
1401-020	N-BK7	60mmx60mmx84.85mm	60mm	λ/10@632.8nm	Uncoated	Inquire
1401-021	UV Fused Silica	60mmx60mmx84.85mm	60mm	λ/10@632.8nm	Uncoated	Inquire

Corner Cube Retroreflector





- Reflect light back 180° toward its source with independence to the incident angle
- Utilize total internal reflections (TIR) or specular reflections
- Both off-the-shelf N-BK7, UVFS retroreflectors and custom versions are available
- Insensibilities to incident angle making them a better option than a mirror when precise angular alignments are needed
- Various shapes of retroreflectors are accessible such as truncated corner cubes, lateral transfer cube retroreflectors, hollow retroreflectors, etc
- Copious selections of substrate materials and coatings

A Corner Cube Retroreflector is an optical component that causes the emerging light to exit in the direction parallel to its entrance direction regardless of the incident angle (i.e. deviate the incident light at 180 degrees without dependence on the incident angle).

Although the name "corner cube retroreflector" contains the word "cube", it does not resemble the shape of a cube. In fact, a corner cube prism composes three faces at the top orthogonal to each other to form a corner of a cube, and a bottom entrance face, which is flat circular, and perpendicular to the cube's diagonal. The working principle of the corner cube is either that light undergoes three times of total internal reflection (TIR) on the orthogonal faces, redirecting towards its original direction, or through specular reflections, depending on whether the reflective faces are coated. Compared with optical mirrors, which can only accomplish the same task when the incident angle is 90°, corner cube retroreflectors are advantages in applications where precise angular alignments are difficult. And the parallelisms at which light is returned relate to the angular accuracies of the perpendicular roofs of the cube retroreflector, the higher the precision of the prism, the better the parallelism of the light path.

With over 10 years of experience and passionate pursuit, Shalom EO has developed a capable production workshop that could offer various kinds of custom and off-the-shelf corner cube retroreflectors, including:

1. standard corner cuber retroreflectors of routine choices.
2. truncated corner cube reflectors of lightweight and compact dimensions.
3. lateral transfer corner cube retroreflectors with one trihedral reflecting face at one terminal of the prism and two trihedral reflecting faces forming a roof edge at the other end are designed for applications obliging a lateral beam displacement.
4. Customized hollow corner retroreflectors that perform great in low-pressure conditions and mitigate the aberrations derived from the dispersion of glass, and temperature fluctuations.

About the substrate material, Shalom EO presents a wide selection such as N-BK7, UV Fused Silica, and other optical glass materials. At the current time, N-BK7 and UVFS corner cube retroreflectors are in storage, if you are interested in other substrate materials, please inquire us. Both high-reflection coatings, anti-reflection coatings, and diverse metal coatings like silver coating, gold coatings, and coatings in the visible, UV, and NIR spectrum could all be furnished at the roof or the entrance face according to your requirements.

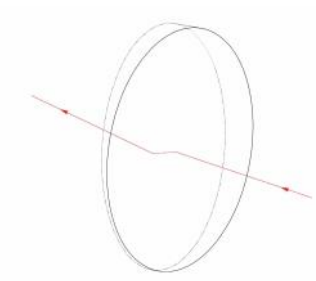
Specifications:

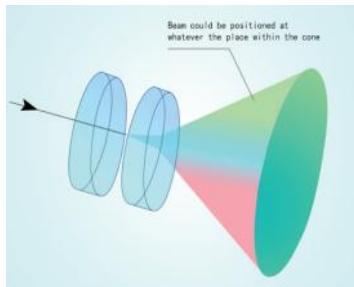
Material	N-BK7, UVFS (standard), or other optical glass	Dimension Tolerance	±0.1mm (standard), or custom
Surface Quality	40/20 S/D (standard), or custom	Clear Aperture	>90% or custom
Flatness	<λ/4@632.8nm (standard), or custom	Angular Tolerance	±3 arc min or custom
Bevelling	<0.2x45° or custom	Coating	uncoated, or custom

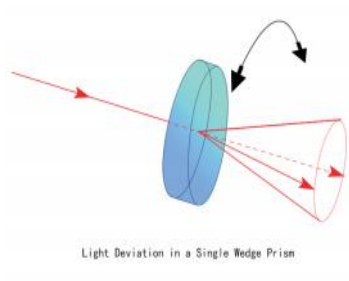
Product List of Corner Cube Retroreflector

Code	Material	Side Length	Thickness	Flatness	Coating	Unit Price
1401-001	N-BK7	3mmx3mmx4.24mm	3mm	λ/10@632.8nm	Uncoated	Inquire
1401-002	UV Fused Silica	3mmx3mmx4.24mm	3mm	λ/10@632.8nm	Uncoated	Inquire
1401-003	N-BK7	5mmx5mmx7.07mm	5mm	λ/10@632.8nm	Uncoated	Inquire

Wedge Prisms







- Ideal for laser beam steering, laser scanning, anamorphic beam shaping
- Coating options: uncoated, 350-700 nm AR Coating, 650-1050 nm AR Coating, 1050-1700 nm AR Coating and custom coatings
- Can be applied both as an individual piece or as a Risley prism pair
- Substrate materials: N-BK7 (standard), UV fused silica, CaF2, MgF2 and ZnSe (Custom)
- High precision polishing available

A Wedge Prism is an optical component with a shallow angle between its input and output faces. Wedge prisms are excellent for laser beam steering applications, as the oblique side and flat side permit the wedge prism to deflect light towards the thicker portion of the prism with specific deflection angles. The larger the wedge angle, the greater the angle of deviation when light emerges from the prism. Furthermore, rotating the wedge prism about the optical axis is a great approach to obtaining circular laser beam scanning output. To make insertion into rotatable mounting more convenient, wedge prisms are often fabricated into circular shapes.

Wedge prisms could either be used as a single element or in pairs (in this case, the wedge prism pair could also be called a Risley Prism Pair). As mentioned above, a single wedge prism could be utilized to deviate a laser beam at a set angle or realize the tracing of a circular light path on the vertical plane. Wedge prisms in pairs can be used for anamorphic beam shaping. Besides, by spinning the two wedge prisms in conjunction at relative rotation speeds, one can realize laser scanning output with spontaneous beam profile.

Hangzhou Shalom EO offers Off-the-shelf Wedge Prisms made from N-BK7 with deviation angles ranging from 2° to 10°. The stock diameters of wedge prisms are all 25.4mm, being standardized for ease of mounting.

We also provide Custom Wedge Prisms made from various materials including N-BK7. UV Fused Silica, CaF2, MgF2, ZnSe, etc. offering 1-10° light deviation. Shalom EO is consistent in investing in developing cutting-edge technologies aimed at fostering a potent production line. We are capable of presenting high-precision wedge prisms with <λ/10 flatness, <30 arc sec angular tolerance, and +0/-0.1mm dimension tolerance.

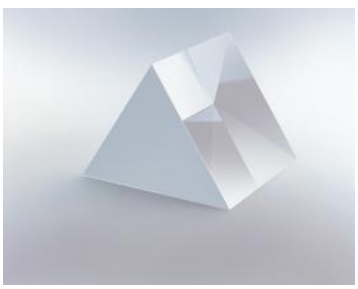
Specifications:

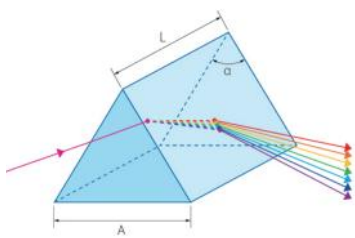
Material	N-BK7	Diameter	25.4mm +0.0/-0.3mm
Dimension Tolerance	±0.15mm	Surface Quality	40/20 S/D
Design Wavelength	633nm	Clear Aperture	>80% of Diameter
Surface Flatness	<λ/10@633nm	Angular Tolerance	±30 arc sec
Thin Edge Thickness	3.0mm	Coating Options	Uncoated; 350-700nm AR Coating; 650-1050nm AR Coating; 1050-1700nm AR Coating

Product List of Wedge Prism

Code	Material	Diameter	Power	Beam Deviation	Wedge Angle	Thickness	Coating	Unit Price
1404-001	N-BK7	25.4mm	3.5 Diopters	2°	3°53'	Wedge Thickness: 4.72mm	Uncoated	Inquire
1404-002	N-BK7	25.4mm	3.5 Diopters	2°	3°53'	Wedge Thickness: 4.72mm	350-700nm AR Coating	Inquire
1404-003	N-BK7	25.4mm	3.5 Diopters	2°	3°53'	Wegde Thickness: 4.72mm	650-1050nm AR Coating	Inquire
1404-004	N-BK7	25.4mm	3.5 Diopters	2°	3°53'	Wegde Thickness: 4.72mm	1050-1700nm AR Coating	Inquire
1404-005	N-BK7	25.4mm	7 Diopters	4°	7°41'	Wedge Thickness: 6.43mm	Uncoated	Inquire
1404-006	N-BK7	25.4mm	7 Diopters	4°	7°41'	Wedge Thickness: 6.43mm	350-700nm AR Coating	Inquire
1404-007	NB-BK7	25.4mm	7 Diopters	4°	7°41'	Wedge Thickness: 6.43mm	650-1050nm AR Coating	Inquire
1404-008	N-BK7	25.4mm	7 Diopters	4°	7°41'	Wedge Thickness: 6.43mm	1050-1700nm AR Coating	Inquire
1404-009	N-BK7	25.4mm	10.5 Diopters	6°	11°22'	Wegde Thickness: 8.11mm	Uncoated	Inquire
1404-010	N-BK7	25.4mm	10.5 Diopters	6°	11°22'	Wegde Thickness: 8.11mm	350-700nm AR Coating	Inquire
1404-011	N-BK7	25.4mm	10.5 Diopters	6°	11°22'	Wegde Thickness: 8.11mm	650-1050nm AR Coating	Inquire
1404-012	N-BK7	25.4mm	10.5 Diopters	6°	11°22'	Wegde Thickness: 8.11mm	1050-1700nm AR Coating	Inquire
1404-013	N-BK7	25.4mm	/	8°	14°52'	Wegde Thickness: 9.74mm	Uncoated	Inquire
1404-014	N-BK7	25.4mm	/	8°	14°52'	Wegde Thickness: 9.74mm	350-700nm AR Coating	Inquire
1404-015	N-BK7	25.4mm	/	8°	14°52'	Wegde Thickness: 9.74mm	650-1050nm AR Coating	Inquire
1404-016	N-BK7	25.4mm	/	8°	14°52'	Wegde Thickness: 9.74mm	1050-1700nm AR Coating	Inquire
1404-017	N-BK7	25.4mm	17.4 Diopters	10°	18°9'	Wedge Thickness: 11.33mm	Uncoated	Inquire
1404-018	N-BK7	25.4mm	17.4 Diopters	10°	18°9'	Wedge Thickness: 11.33mm	350-700nm AR Coating	Inquire
1404-019	N-BK7	25.4mm	17.4 Diopters	10°	18°9'	Wedge Thickness: 11.33mm	650-1050nm AR Coating	Inquire
1404-020	N-BK7	25.4mm	17.4 Diopters	10°	18°9'	Wedge Thickness: 11.33mm	1050-1700nm AR Coating	Inquire

Brewster Angle Prisms





- Low loss for P-polarized beam
- Selecting a single wavelength from a multi-wavelength laser
- Tuning allowed through tilting of prism
- Various substrate materials: BK7, Fused Silica, MgF2, CaF2, N-SF10, etc.

Brewster Prism has an apex angle such that a p-polarized light incident at Brewster's angle will pass through the prism in a direction parallel to the base of the prism with minimum deviation. When light strikes a transparent medium at the Brewster angle, the reflected rays and refracted light components become perpendicular to each other, resulting in the reflected light being all polarized parallel to the interface. Brewster Prisms are often used in situations where surface reflection losses cannot be tolerated. Brewster Prisms can also function to select a single wavelength from a multi-wavelength laser. Tuning is allowed through tilting the prisms.

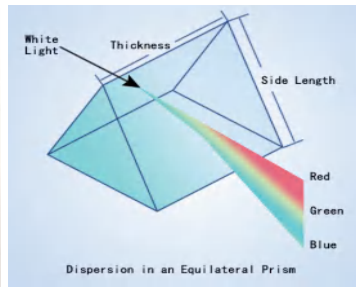
Shalom EO supplies Custom Brewster Angle Prisms. Utilizing accurate geometric control, we exploit the full effect of the Brewster angle, ensuring optimal polarization manipulation and minimal optical losses.

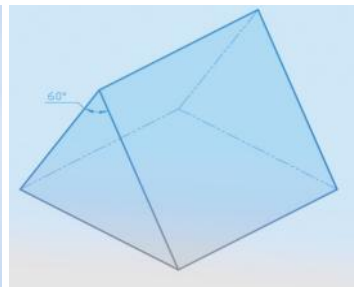
Specifications:

Material	N-BK7, Fused Silica, MgF2, N-SF10...	Range of Size	/
Dimension Tolerance	+0.0/-0.2mm	Surface Quality	40/20 S/D
Clear Aperture	>90%	Flatness	<λ/4@632.8nm
Angle Tolerance	<5 arc minutes	Polished Surface	Two side surfaces polished, base is fine ground
Chamfer	Protective<0.5mmx45°	Coating	uncoated, custom

Equilateral Prisms







- Material options: F2, CaF2, UV Fused Silica (standard);N-BK7, UV Fused Silica, SF11, N-SF11, CaF2, MaF2, ZnSe, F2, N-F2 (Custom)
- High precision: ±0.15mm dimension tolerance, λ/10 flatness, ±3 arc min angular tolerance accessible
- Coating Options: uncoated (standard), or custom coatings
- Low abe number optimized for dispersion
- Maximum clear aperture and minute reflection-loss of p-polarization when operated at minimum deviation angle

Equilateral Prisms are triangular optical prisms each that has three identical side lengths and three 60°apex angles. Equilateral prisms are often utilized for dispersive purposes (i.e. separating a white light source into a spectrum of multiple colors). Depending on the substrate materials, equilateral dispersive prisms could be selected to break up different spectral regions. To some extent, equilateral prism functions just like a diffraction grating, only that the prisms present better brightness, greater endurance to power, and fewer problems associated with higher orders.

Regarding our stocked Equilateral Prisms, the substrates are made of SCHOTT F2, CaF2, and UV Fused Silica. With vanguard production techniques and rigorous inspection standards, our team is capable of manufacturing stock equilateral prisms of high precision, with a dimension tolerance of ±0.15mm, surface flatness of λ/10@632.8nm, and an angular tolerance of ±3 arc min. Under normal circumstances the off-the-shelf equilateral dispersive prisms are uncoated, but custom coatings could also be tailored.

We also offer Custom Equilateral Prisms made from a wide assortment of optical materials and high-refractive-index materials including N-BK7, UV Fused Silica, SF11, N-SF11, CaF2, MaF2, ZnSe, F2, N-F2, etc. with transmission range of these materials spans from ultra-violet, visible, to infrared. Anti-reflection coatings with specified bandwidths are available to reduce the loss at the prism-to-air interface for high-refraction materials, with the additional strength to protect the equilateral dispersive prism from chemical corrosions and other contaminants. The angular tolerance is the same as the stocked equilateral prisms (±3 arc minutes), the surface qualities of our custom equilateral prisms could be 60/40, 40/20, 20/10, 10/5 S/D, and the flatness <λ/4, <λ/8, <λ/10@632.8nm, you could select according to your interests. we are confident in delivering both high-precision prisms with tight geometric bridles and standard-grade prisms for requirements that are less challenging.

Specifications:

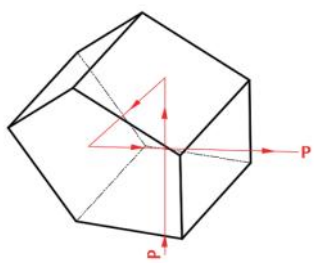
Material	F2, CaF2,UV Fused Silica	Clear Aperture	>90%
Dimension Tolerance	±0.15mm at best	Surface Quality	40/20 S/D or 60/40 S/D
Angular Tolerance	3 arc min at best	Flatness	λ/10@632.8nm at best
Coating	Uncoated, or Custom	Bevelling	<0.2mmx45°

Product List of Equilateral Prism

Code	Material	Aperture	Side Length	Thickness	Surface Quality	Angular Tolerance	Flatness	Coating	Unit Price
1406-001	F2	>90%	10mmx10mmx10mm	10mm	60/40 S/D	±3 arc min	λ/10@633nm	Uncoated	Inquire
1406-002	F2	>90%	15mmx15mmx15mm	15mm	60/40 S/D	±3 arc min	λ/10@633nm	Uncoated	Inquire
1406-003	CaF2	>70%	15mmx15mmx15mm	15mm	40/20 S/D	±10 arc min	λ/2@633nm	Uncoated	Inquire
1406-004	F2	>90%	20mmx20mmx20mm	20mm	60/40 S/D	±3 arc min	λ/10@633nm	Uncoated	Inquire
1406-005	F2	>90%	25mmx25mmx25mm	25mm	60/40 S/D	±3 arc min	λ/10@633nm	Uncoated	Inquire
1406-006	UV Fused Silica	>90%	25mmx25mmx25mm	25mm	60/40 S/D	±3 arc min	λ/10@633nm	Uncoated	Inquire
1406-007	CaF2	>90%	25mmx25mmx25mm	25mm	60/40 S/D	±3 arc min	λ/10@633nm	Uncoated	Inquire
1406-008	CaF2	70%	25mmx25mmx25mm	25mm	40/20 S/D	±10 arc min	λ/2@633nm	Uncoated	Inquire

Penta Prisms





- Deviate incident beam at the angle of 90°
- Coating options: Protective Aluminum, Single layer MgF2, Multi-layer AR coating or custom options
- For observation systems and measuring applications

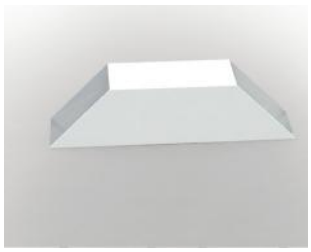
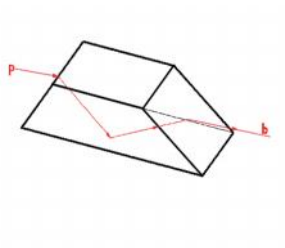
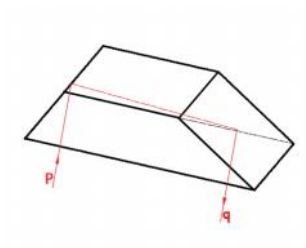
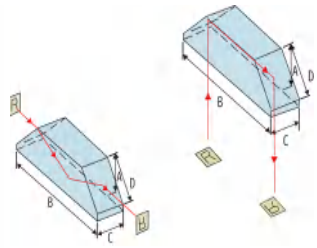
Penta prism is an optical glass block comprising five flat surfaces, and the entrance and exit faces form a right angle. It is often used to deviate a light beam by 90 degrees without inverting or reversing the image. The 90-degree deviation angle is a fixed value independent of the entrance angles, which renders penta prisms advantageous in operation context requiring an exact 90° deviation without the need for precise orientation of the prism.

Hangzhou Shalom EO offers Custom Penta Prisms with a wide operating wavelength range from UV to IR spectrum. We provide multiple coating options that cater to various needs.

Specifications:

Material	N-BK7, UV Fused Silica	Range of Size	/
Dimension Tolerance	±0.2mm	Surface Quality	60/40 S/D
Clear Aperture	>90%	Flatness	<λ/4@632.8nm
Angle Tolerance	<30arc seconds	Chamfer	Protective<0.5mmx45°
Coating	Protected Aluminum reflective coating Single Layer MgF2, AR coating or custom		

Dove Prisms

- Designed for rotation and inversion of image or retroreflecting lights
- Used in astronomical and interferometrical applications
- Coating options: uncoated, AR coated on diagonal faces, or aluminum coatings on diagonal faces

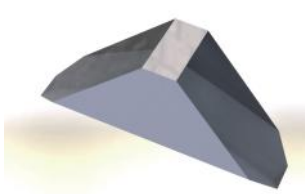
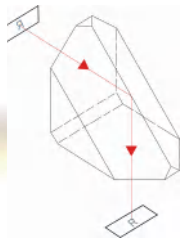
A Dove prism is a kind of reflective prism, shaped from a truncated right-angle prism, the fundamental functions of a dove prism are inverting, and rotating images or it can also be used as a retroreflector contingent on the rotation angle of the prism the propagation path of light.

Hangzhou Shalom EO offers custom dove prisms made of N-BK7 optical glass, which is ROHs-compliant material in SCHOTT's catalog, with optical excellence and good comprehensive properties. Coating options include uncoated, anti-reflection coatings on diagonal faces, aluminized diagonal faces are also optional. Our dove prism serve as capable componnets in astronomical and interferometrical applications.

Specifications:

Material	N-BK7	Dimension Tolerance	±0.2mm
Surface Quality	60/40 S/D	Clear Aperture	>90%
Flatness	<λ/4@632.8nm	Angle Tolerance	<3 arc minutes
Chamfer	Protective<0.5mmx45°	Coating	Uncoated, Custom

Roof Prisms

- 90° deviation of image of beam
- Optional silver coating on the roof surface
- Applications: Spotting scopes, Binoculars, Prism Diagonals, Optical instruments

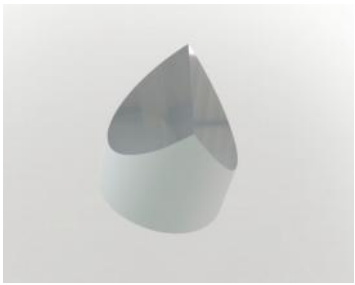
Roof prisms also called right-angle roof prisms or Amici roof prism are reflective optical prisms that contain a section where two faces meet at a 90° angle. The hypotenuse of the roof prism exploits total internal reflection (TIR) to reflect the image through the prism. Roof prisms redirect a light beam by 90° and at the same time invert the light beam. In passing through the prism, the image is both deflected right-to-left and top-to-bottom, this trait make them ideal for applications in binoculars, spotting scopes, and optical instruments.

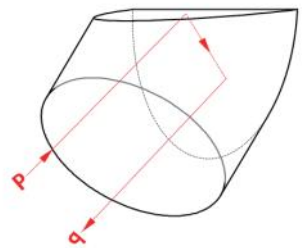
Hangzhou Shalom EO offers roof prisms made from BK7, UV fused silica, and other optical glass, optional silver coating on the roof surface is also available.

Specifications:

Material	N-BK7, UV Fused Silica, other optical glass	Angular Tolerance	±3 arcmin
Surface Quality	40/20 S/D	Clear Aperture	>90%
Flatness	<λ/10@632.8nm	Roof Angle Tolerance	Up to 3 arc seconds
90° Angle Tolerance	±2 arcmin or ±5 arcsec	Coatings	Uncoated, Custom

Porro Prisms





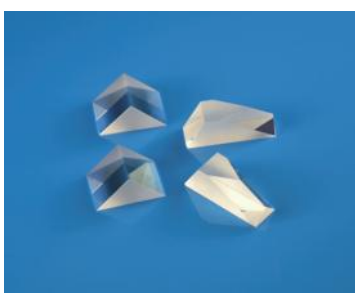
- Made of BAK4, BK7, UV fused silica
- Remarkable for applications in periscopes, binoculars, and monoculars
- Combination of two Porro prisms as Porro prism pairs
- Designed to manipulate of the orientation of the image

The Porro Prism is a kind of reflection prism, that is designed to manipulate the orientation of the image. A single Porro prism resembles the shape of a right geometric prism with right-angled triangular end faces. Light entering the large rectangular face of a single Porro prism is rotated 180°, exiting in the opposite direction offset from its entrance point. A prevalent scheme to use Porro prisms is to use them as double porro prism pairs, comprising two porro prisms with their long sides faces assembled, but with a second prism rotated 90° relative to the first. The net effect of such a prism pair is a beam parallel to its original direction but displaced from its initial location, with the image rotated 180°. This kind of prism pair is often used in the field of optical telescopes, and binoculars to re-orient an inverted image (image erection).
Hangzhou Shalom EO offers Custom Porro prisms made of BAK4, BK7, and UV fused silica, our Porro prisms find widespread usage in periscopes, telescopes, binoculars, and monoculars.

Specifications:

Material	BAK4, UVFS, N-BK7 or equivalent	Dimension Tolerance	±0.2mm
Surface Quality	60/40 S/D	Clear Aperture	>90%
Flatness	<λ/10@632.8nm	Wavelength Distortion	<λ/4@632.8nm
Deviation	180°±10 arc seconds	Roof Angle Tolerance	<5 arc seconds
Chamfer	Sharp roof, other protective chamfered	Coating	None, Available

Sapphire Prisms



- Wide transmission wavelength range: 0.15~5μm
- Extreme hardness for harsh environment
- Chemical and thermal resistance
- Various prism shapes: Right angle prisms, 60° equilateral dispersing prism, and custom

Due to their incomparable mechanical strength (Mohs hardness 9), high thermal conduction, endurance to scratch and abrasions, and resistance to common acids and alkalis, single crystal sapphire (Al2O3) prisms are the top performers in demanding contexts (such as lasers) and extreme condition and climates (e.g., vacuum, high heat, corrosive atmosphere). Because of the superb structural strength of sapphire, Sapphire Prisms can be produced far more compact than those made of other popular materials. Sapphire has good transmittance between 0.15 and 5.5 m, which covers the UV to MWIR wavelength range.

Hangzhou Shalom EO offers customized prisms upon customers' request. The prism shapes include right angle prisms, 60°equilateral dispersing prisms, and other custom shapes (e.g., dove prisms, Penta prisms, roof prisms, rhomboid prisms.)

Specifications:

Shapes	Right angle prisms, 60° equiliateral dispersing prism, customized prisms	Materials	Optical grade single crystal sapphire
Aperture	>90%	Dimension Tolerance	+0.0/-0.2mm
Thickness Tolerance	+/-0.2mm	Surface Quality	40/20 S/D
Flatness	1Lambda@633nm		

Physiccal and Optical Properties:

Transmission Range	0.17 to 5.5 µm	Refractive Index	No 1.75449; Ne 1.74663 @ 1.06 µm
Reflection Loss	14% at 1.06 µm	Absorption Coefficient	0.3 x 10-3 cm-1 @ 2.4 µm
Reststrahlen Peak	13.5 µm	dn/dT	13.1 x 10-6 @ 0.546 µm
dn/dµ = 0	1.5 µm	Density	3.97 g/cc
Melting Point	2040°C	Thermal Conductivity	27.21 W m-1 K-1 @300K
Thermal Expansion	5.6 (para) & 5.0 (perp) x 10-6 /K *	Hardness	Knoop 2000 with 2000g indenter
Specific Heat Capacity	763 J Kg-1 K-1 @ 293K	Dielectric Constant	11.5 (para) 9.4 (perp) @ 1MHz
Youngs Modulus (E)	335 GPa	Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa	Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	300 MPa (45,000 psi)	Poisson Ratio	0.25
Solubility	98 x 10-6 g/100g water	Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c		

Superpolished Optics



In some demanding applications such as Deep Ultra-violet (DUV) lasers, high-power lasers, ring laser gyros, and femtosecond lasers, the optical components incorporated necessitate a minimal scattering effect to minimize the loss and raise efficiencies in lasers, these optical components must be engineered and processed into a premium precision grade with ultra-low surface roughness, these optics are called "superpolished" optics.

Hangzhou Shalom EO offers superpolished optical components made from substrate materials UV fused silica, BK7, sapphire, ZnSe, YAG, etc. A Unique classical polishing technique is developed in Shalom EO to manufacture the super-polished optics, a striking <1Å roughness can be obtained, with high flatness and surface quality. Superpolished lenses, windows and mirrors, and polished substrates are available.

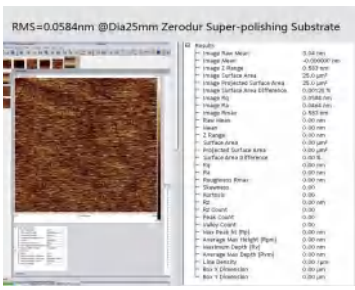
Mirrors for Ring Laser Gyros



- A unique polishing technique modified on the basis of classical polishing technique
- Surface Roughness down to 1Å
- Low absorption and scattering loss
- Excellent resistance to the plasma environment
- Roughness measured by Atomic Force Microscope (AFM), Flatness measured by Zygo interferometer

A Ring Laser Gyroscope (RLG) consists of a ring laser having two independent counter-propagating resonant modes over the same path, it is an optical gyroscope that utilizes narrowband light waveforms traveling a path, created using mirrors, to measure rotation based on the Sagnac effect.

To be competent for integration into the Ring Laser Gyroscope (RLG), the mirrors and outcoupling coatings must have ultra-low absorption and scattering loss, exceptional resistance to the plasma environment, and long durability.



Hangzhou Shalom EO offers the mirrors or substrates used in the laser gyro with a roughness of less than 1Å, by our classical super polishing line, atom force roughness measuring system, and Zygo interference flatness test instrument, we can provide the laser gyro mirrors in stable and identical quality and volume quantity.

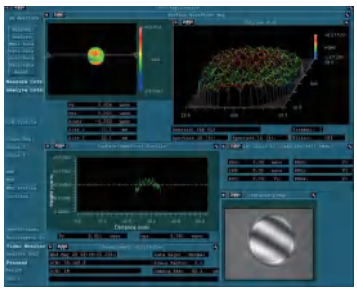
Features:

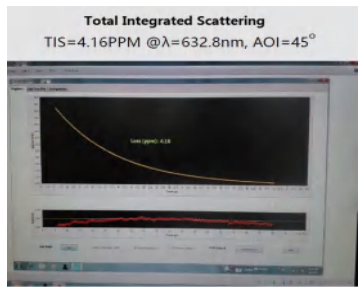
1. Unique classical polishing method

Although the magnetorheological fluid polishing method is thought to be a promising measure to fabricate ultra-low roughness optical surfaces, its high cost and low production rate make it unpractical in industrial applications, therefore most of the super-polished optics are made from the classical polishing method. A unique processing technical modified on the basis of classical polishing is developed in Shalom EO to make the super-polished optics, the pitch plate is used as the polishing tool, and <1Å roughness can be obtained using our polishing craft. The testing shows that our substrates and mirrors work well in the laser gyro system.

2. Roughness measurement

For the primary scattering test, we use the green laser of 25 and 40 mW, the scattering point can be found by watching the reflected laser light from the surfaces of the optics, this is simple and fast as the primary test of surface roughness. For the final test of the roughness or scattering test, the Atom Force Microscope (AFM) from Bruker is used to measure the final roughness of the polished optic.





3. Flatness Measuring
The Zygo Lambda 2000 series Module GPIXP-D6" is utilized to measure the final flatness of the polished surfaces.

4. Coating Testing
The final processing of coating is also critical for the laser gyro mirrors, low absorption and low scattering loss are required, and the Total Integrated Scattering or TIS is measured to evaluate the surface loss of the mirrors.

Specifications:

Substrate Materials	Zerodur Glass, Fused Silca	Diameters (mm)	F12.5, F19.05, F25
Surface Roughness RMS	<0.1nm	Total Integrated Scattering (TIS)	5ppm
Surface Quality	10/5 S/D; 0/0 at central area	Flatness	<Lambda/20 @ 633nm

Super Polished Substrates and Mirrors



- Various substrate materials: BK7, UV fused silica, Zerodur, ZnSe, ZnS, Ge, Si, CaF2, MgF2, and Sapphire.
- A unique polishing technique developed on the basis the classical polishing method
- Surface Roughness down to 1Å
- High Reflection (HR) coating and Anti-reflection (AR) available
- Applications: DUV lasers, high-power lasers, gyroscope

For some demanding applications like DUV (deep ultraviolet) lasers, ultra-high power laser systems, and ring laser gyroscopes, high reflection and low scattering loss of the mirrors are some of the most critical factor, where substrates with roughness values down to micros are required to produce the mirrors competent for the applications.

The super polishing technique is a fabrication technique often utilized to manufacture super-polished mirror substrates for optical applications. Hangzhou Shalom EO has developed an efficient and reliable super-polishing technique through modification of the classical super-polishing method, the optical substrates or mirrors produced using our technique feature roughness of less than 1Å on large production scales and guarantee fast despatch for our customers. Our inspection department incorporates an Atom Force Roughness Measuring System and Zygo Interference Flatness Test Instrument, where we implement strict control of qualities. Various superpolished mirror substrates of different materials including BK7, UV fused silica, Zerodur, ZnSe, ZnS, Ge, Si, CaF2, MgF2, and Sapphire are available, in addition to the mirrors for Ring Gyro Lasers.

Although the magnetorheological (MR) fluid polishing technique (where optical surfaces are polished in a computer-controlled magnetorheological finishing slurry) seems a promising approach to achieve finishes of extremely low roughness in the fabrication of optics, its high cost and inefficient production rate make it unpractical for industrial applications. Therefore, most of the super-polished optics are made from conventional and classical polishing methods. A unique modification to the classical polishing technique is developed in Shalom EO for the production of super-polished mirrors and mirror substrates. In the processing procedure, pitch plates are configured as the mounting tool. Shalom EO is capable of realizing super polished mirror and mirror substrates of <1Å roughness, 0/0 scratch/dig in the central area, and superior reflection through our state-of-the-art polishing technique.

Inspection Results:

1. Atom Force Microscope Inspection

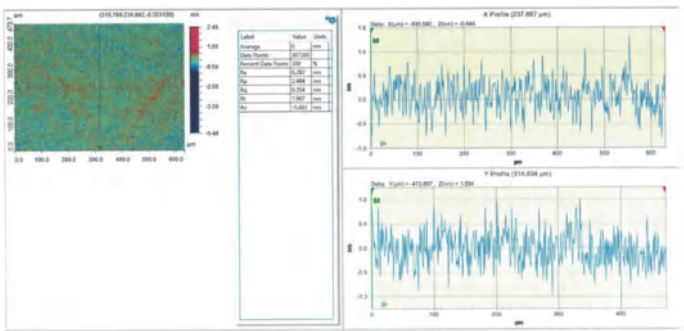


Figure1. Roughness of Superpolished Surface Measured by Atom Force Microscope (AFM)
(Fused Silica Substrate with Diameter 200mm, Ra=0.28nm)

2. Zygo Interferometer Inspection

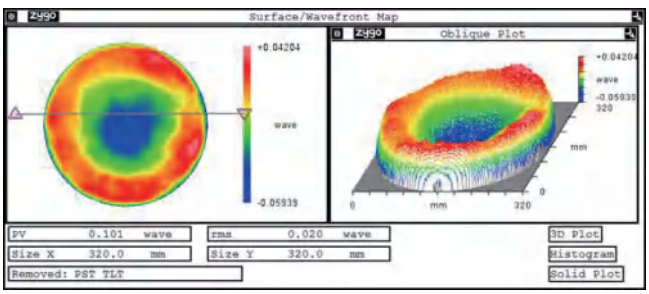


Figure 2. Flatness of Super Polished Surface Measure by Zygo Interferometer
(Fused Silica Substrate of Diameter 300mm, PV=0.101 Wave @633nm)

Specifications:

Material Specifications	ZnSe, ZnS	Ge, Si, CaF2, MgF2	Fused Silica, BK7. Zerodur	Sapphire
Diameter	up to Φ300mm	up to Φ300mm	up to Φ350mm	up to Φ300mm
PV	PV≤0.1λ @ 632.8nm	PV≤0.1λ @ 632.8nm	PV≤0.1λ @ 632.8nm	PV≤0.15λ @ 632.8nm
rms	rms≤0.02λ @ 632.8nm	rms≤0.02λ @ 632.8nm	rms≤0.02λ @ 632.8nm	rms≤0.03λ @ 632.8nm
Roughness	≤0.2nm	≤0.2nm	≤0.1nm	≤0.2nm

03 Optical Filters

Optical Filters

Optical filters transmit light within a selective range of wavelengths, operating on the fundamental rules of interference, absorption, and transmission of light. The core of designing optical filters is the engineering and utilization of the refractive indices, materials characteristics, and even arrangement patterns of coatings, dyes, and substrates so that the optical media becomes transmissive or reflective to certain bands of wavelengths or a specific line of wavelength to meet specific spectral selection requirements. Optical filters serve as indispensable components in manipulating the spectral characteristics of light, offering selective transmission, reflection, or absorption of light across specific wavelengths or spectral regions. The applications are manifold, ranging from photographic, fluorescence microscopes, spectroscopes, biochemical, machine vision inspection, and astronomical, etc.

Hangzhou Shalom EO offers a series of Off-the-shelf and Custom Optical Filters, including Bandpass Filters, Longpass Filters, Shortpass Filters, Fluorescence Filters, Neutral Density Filters, Dichroic Filters, Notched Filters, Colored Glass Absorptive Filters, IR Filters, Laser line Filters, Machine Vision Filters, Linear Variable Filters, Biochemical Filters, Multispectral Filters, and Pixel Level Filters.

Shalom EO is a professional supplier of optical filters adept at providing a vast selection of high-performance optical filters, from Bandpass to Longpass, Shortpass, Fluorescence, Neutral Density, and beyond, our extensive range caters to diverse needs. Harnessing cutting-edge advancements in a combination of optical engineering, coating, and processing techniques, we aim to optimize efficiencies, and transmissions, and empower professionals across various fields to elevate the optical potential. Our filters also boast outstanding durabilities, devised to withstand the rigors of demanding environments. Our proficient sales group and tech support team are obliged to provide exceptional service and support at every stage of your project, where you can benefit from the guidance of our knowledgeable team.

Biochemical Optical Filters

• Bandpass Filters 205

Longpass Filters

• Longpass Filters (Standard) 216

Shortpass Filters

• Shortpass Filters (Custom) 218
• Shortpass Filters (Standard) 219

Neutral Density Filters

• UV ND Filters (250-380nm) 220
• VIS ND Filters (400-700nm) 221
• VIS-NIR ND Filters (350-1100nm) 221
• Circular Variable ND Filters 222
• Rectangular Continuously Variable ND Filters 223
• Infrared Neutral Density Filters 223

Colored Glass Absorptive Filters

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Dichroic Filters

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• Narrowband Filters for Biochemistry Analyzers 232
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• Linear Variable Edge Filters 244

Multispectral Filters

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Pixel Level Filters

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• Pixel Level Stepped Filters 249

Bandpass Filters



- Mounted narrowband filters, hard coatings are deposited
- Colored glass+BK7/Fused Silica (identical to HOYA)
- Transmission central wavelength range: 220-10500nm
- Various bandwidths, deep blocking depth (max. OD6 for standard or custom)
- Diameters: 6-25.4mm

Bandpass Filters (also called band-pass filters, BP filters) are optical designed to transmit a portion of the spectrum while blocking the remaining light, isolating desired spectral ranges while blocking light outside the specified region. The width of the transmission waveband can range from less than an Ångström to several hundred nanometers. This selective transmission is critical in applications where precise control over the optical spectrum is essential for accurate analysis or communication. Bandpass filters find extensive usage in life science, industrial, medical, photography, or Research and Development (R&D) realms.

Hangzhou Shalom EO offers Bandpass Filters of a diverse range of categories including Narrow Bandpass Filters, Broad Bandpass Filters, Narrowband Filters for Biochemistry Analyzers, Narrowband Filters for Enzyme Labelling Instrument, Narrowband Filters for Polarimeter, Fluorescence Filters, Ultra-Violet (UV) Narrowband Filters and High Transmission Narrow Bandpass Filters.

Each of our bandpass filters consists of multiple layers of dielectric coatings deposited on a glass substrate, creating an interference-based construction to achieve desired transmission characteristics and optimal performance, colored glass can be bonded with BK7 or Fused Silica substrates to further enhance the spectral selection effectiveness (the glass we sourced are identical to that of HOYA). Our bandpass filters offer exceptional blocking depth, with a maximum of OD6 for standard versions and we can do even better. Also, high-precision polishing, tight geometric control, robust substrate material, and water-resistant design ensure optical excellence and long life spans. Regarding the standard versions, there is a wide selective central wavelength range of 200-10500nm, and bandwidths of 3-340nm, while other custom central wavelengths and bandwidths are also available. Hundreds of mounted stock modules with various standardized dimensions for convenient installation are available, and hard coatings can be deposited. We also provide custom bandpass filters tailored upon request.

Product List of Bandpass Filters

Substrate Materials	Colored glass+BK7/Fused Silica	Transmission Central Wavelength Range	220-10500nm
Diameters	6-25.4mm	Mount	Mounted
Coating	Hard coating		

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission (%)	Blocking Range(nm)	Optical Density	Diameter,mounted (mm)	Aperture	Price
415-001	220nm	10nm	/	200 ~1200nm	≥OD4	6mm	4mm	Inquire
415-002	220nm	10nm	/	200 ~1200nm	≥OD4	8mm	6mm	Inquire
415-003	220nm	10nm	/	200 ~1200nm	≥OD4	10mm	6mm	Inquire
415-004	220nm	10nm	/	200 ~1200nm	≥OD4	10mm	7mm	Inquire
415-005	220nm	10nm	/	200 ~1200nm	≥OD4	12mm	8mm	Inquire
415-006	220nm	10nm	/	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40101-001	230±2	12±3	> 13	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
40101-002	240±2	12±3	> 13	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
40101-003	254±2	10±2	> 20	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
415-007	254nm	10nm	/	200 ~1200nm	≥OD4	6mm	4mm	Inquire
415-008	254nm	10nm	/	200 ~1200nm	≥OD4	8mm	6mm	Inquire
415-009	254nm	10nm	/	200 ~1200nm	≥OD4	10mm	6mm	Inquire
415-010	254nm	10nm	/	200 ~1200nm	≥OD4	10mm	7mm	Inquire
415-011	254nm	10nm	/	200 ~1200nm	≥OD4	12mm	8mm	Inquire
415-012	254nm	10nm	/	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40101-004	260±2	10±2	> 20	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
40101-005	266±2	10±2	> 20	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
415-013	275nm	10nm	/	200 ~1200nm	≥OD4	6mm	4mm	Inquire
415-014	275nm	10nm	/	200 ~1200nm	≥OD4	8mm	6mm	Inquire
415-015	275nm	10nm	/	200 ~1200nm	≥OD4	10mm	6mm	Inquire
415-016	275nm	10nm	/	200 ~1200nm	≥OD4	10mm	7mm	Inquire
415-017	275nm	10nm	/	200 ~1200nm	≥OD4	12mm	8mm	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
415-018	275nm	10nm	/	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40101-006	280±2	12±2	＞ 20	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
415-019	300nm	10nm	/	200 ~1200nm	≥OD4	6mm	4mm	Inquire
415-020	300nm	10nm	/	200 ~1200nm	≥OD4	8mm	6mm	Inquire
415-021	300nm	10nm	/	200 ~1200nm	≥OD4	10mm	6mm	Inquire
415-022	300nm	10nm	/	200 ~1200nm	≥OD4	10mm	7mm	Inquire
415-023	300nm	10nm	/	200 ~1200nm	≥OD4	12mm	8mm	Inquire
415-024	300nm	10nm	/	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40101-007	302±2	12±2	＞ 20	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
40101-008	330±2	12±2	＞ 20	200-2000	0D3	Φ12.7/Φ25.4	/	Inquire
40101-009	340±2	10±2	＞ 50	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
411-001	340nm	10nm	＞ 50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-002	340nm	10nm	＞ 50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-003	340nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-004	340nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-005	340nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-006	340nm	10nm	＞ 50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40101-010	350±2	08±2	＞ 35	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40102-001	352±2	10±2	＞ 45	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40102-003	355±2	10±2	＞ 50	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40102-002	355±2	8±2	＞ 40	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40102-004	358±3	13±3	＞ 55	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40102-005	360±2	12±2	＞ 50	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40102-006	365±2	10±2	＞ 50	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40102-007	365±5	40±5	＞ 60	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40102-008	365±8	80±8	＞ 85	200-800	0D4	Φ12.7/Φ25.4	/	Inquire
40102-009	370±2	10±2	＞ 55	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
411-055	370nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
40102-010	375±2	10±2	＞ 55	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-011	379±2	12±2	＞ 60	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
411-007	380nm	10nm	＞ 50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-008	380nm	10nm	＞ 50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-009	380nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-010	380nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-011	380nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-012	380nm	10nm	＞ 50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40102-012	387±2	10±2	＞ 60	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-013	395±2	10±2	＞ 70	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-014	400±2	10±2	＞ 80	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40102-015	400±5	30±5	＞ 80	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-016	405±2	10±2	＞ 80	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-017	405±3	20±3	＞ 80	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
411-013	405nm	10nm	＞ 50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-014	405nm	10nm	＞ 50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-015	405nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-016	405nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-017	405nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-018	405nm	10nm	＞ 50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40102-018	410±2	8±2	＞ 80	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-019	410±3	20±3	＞ 80	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40102-020	410±5	25±5	＞ 80	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-021	410±5	30±5	＞ 80	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40102-022	412±2	10±2	＞ 80	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
40102-023	415±2	10±2	＞ 80	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40102-024	415±3	20±3	＞ 80	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40102-025	415±8	55±8	＞ 80	200-800	OD4	Φ12.7/Φ25.4	/	Inquire
40102-026	418±2	10±2	＞ 90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-001	420±2	10±2	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40103-002	420±5	22±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
413-001	420nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
413-002	420nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
413-003	420nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
413-004	420nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
413-005	420nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
413-006	420nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40103-003	425±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-004	427±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-005	435±2	10±2	＞90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40103-006	440±2	10±2	＞90	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
411-056	440nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
40103-007	441.6±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-008	445±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-009	447±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-010	450±10	100±10	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-011	450±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-012	450±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-013	450±5	30±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40103-014	450±8	50±8	＞90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
412-007	450nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
412-008	450nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
412-009	450nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
412-010	450nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
412-011	450nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
412-012	450nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40103-015	455±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-016	456±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-017	460±3	20±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40103-018	465±3	13±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40103-019	466±8	50±8	＞90	200-800	OD4	Φ12.7/Φ25.4	/	Inquire
40103-020	468±8	48±8	＞90	300-900	0D4	Φ12.7/Φ25.4	/	Inquire
40103-021	470±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40103-022	470±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40103-023	470±5	25±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40103-024	470±5	30±5	＞90	200-800	0D6	Φ12.7/Φ25.4	/	Inquire
40103-025	470±5	35±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
414-001	470nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
414-002	470nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
414-003	470nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
414-004	470nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
414-005	470nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
414-006	470nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40104-001	475±2	10±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40104-002	475±3	15±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40104-003	475±3	20±3	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40104-004	475±5	30±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40104-005	475±5	40±5	＞90	400-700	0D4	Φ12.7/Φ25.4	/	Inquire
40104-006	480±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40104-007	485±3	18±3	＞90	400-1000	0D4	Φ12.7/Φ25.4	/	Inquire
40104-008	486.1±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40104-009	488±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40104-010	490±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40104-011	492±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
411-019	492nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-020	492nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-021	492nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-022	492nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
411-023	492nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-024	492nm	10nm	＞ 50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40104-012	495±2	10±2	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40104-013	495±3	20±3	＞ 90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40104-014	496±2	10±2	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40104-015	498±2	10±2	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40104-016	500±2	10±2	＞ 90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40104-017	500±5	30±5	＞ 90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
411-057	500nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
40104-018	505±2	10±2	＞ 90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40104-019	505±3	16±3	＞ 90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40104-020	506±5	35±5	＞ 90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40104-021	506±5	35±5	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40104-022	508±2	10±2	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40104-023	508±3	15±3	＞ 90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40104-024	510±2	10±2	＞ 90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40104-025	510±3	15±3	＞ 90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40104-026	515±2	10±2	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40104-027	515±8	50±8	＞ 90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40105-001	517±5	35±5	＞ 90	200-800	0D4	Φ12.7/Φ25.4	/	Inquire
40105-002	519±2	10±2	＞ 90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40105-003	520±10	100±10	＞ 90	200-800	OD4	Φ12.7/Φ25.4	/	Inquire
40105-006	520±2	10±2	＞ 90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40105-005	520±2	10±2	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40105-004	520±2	10±2	＞ 90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40105-007	520±3	20±3	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-008	520±5	30±5	＞ 90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
414-007	520nm	10nm	＞ 80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
414-008	520nm	10nm	＞ 80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
414-009	520nm	10nm	＞ 80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
414-010	520nm	10nm	＞ 80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
414-011	520nm	10nm	＞ 80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
414-012	520nm	10nm	＞ 80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40105-009	523±5	30±5	＞ 90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40105-011	525±2	10±2	＞ 90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40105-010	525±2	6±2	＞ 90	300-900	OD5	Φ12.7/Φ25.4	/	Inquire
40105-012	525±3	17±3	＞ 90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40105-013	525±3	20±3	＞ 90	200-800	0D6	Φ12.7/Φ25.4	/	Inquire
40105-014	525±8	50±8	＞ 90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
40105-015	529±2	10±2	＞ 90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40105-016	530±2	10±2	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40105-017	530±3	20±3	＞ 90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40105-018	530±8	60±8	＞ 90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
40105-020	532±2	10±2	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-019	532±2	08±2	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-021	532±3	20±3	＞ 90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40105-022	532±5	30±5	＞ 90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-023	532±5	40±5	＞ 90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40105-024	532±8	50±8	＞ 90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-025	535±2	8±2	＞ 90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40105-026	535±3	15±3	＞ 90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-027	535±3	20±3	＞ 90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40105-028	540±2	10±2	＞ 90	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
412-019	540nm	10nm	＞ 50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
412-020	540nm	10nm	＞ 50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
412-021	540nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
412-022	540nm	10nm	＞ 50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
412-023	540nm	10nm	＞ 50	200 ~1200nm	≥OD4	12mm	8mm	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
412-024	540nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40106-001	542±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40106-002	545±2	10±2	＞90	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
40106-003	546±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40106-004	546±3	15±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
411-025	546nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-026	546nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-027	546nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-028	546nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-029	546nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-030	546nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40106-005	547±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40106-006	548±5	35±5	＞90	200-700	OD4	Φ12.7/Φ25.4	/	Inquire
40106-007	550±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40106-008	550±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40106-009	550±8	70±8	＞90	300-900	0D4	Φ12.7/Φ25.4	/	Inquire
411-058	550nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
40106-010	552±2	10±2	＞90	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
40106-011	555±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40106-012	555±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40106-013	555±8	45±8	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40106-014	558±2	12±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40106-015	558±8	80±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40106-016	560±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40106-017	560±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40106-018	564±3	20±3	＞90	400-800	OD6	Φ12.7/Φ25.4	/	Inquire
40106-019	565±2	9±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40106-020	565±3	15±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40106-021	565±5	40±5	＞90	400-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40106-022	565±5	40±5	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40106-023	570±2	10±2	＞90	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
40106-024	570±3	20±3	＞90	200-800	OD6	Φ12.7/Φ25.4	/	Inquire
412-025	570nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
412-026	570nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
412-027	570nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
412-028	570nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
412-029	570nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
412-030	570nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40106-025	575±2	10±2	＞90	400-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40106-026	575±3	15±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
411-031	578nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-032	578nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-033	578nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-034	578nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-035	578nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-036	578nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40107-001	580±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40107-002	585±10	130±10	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40107-003	585±2	10±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
413-013	589nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
413-014	589nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
413-015	589nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
413-016	589nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
413-017	589nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
413-018	589nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40107-004	590±10	100±10	＞90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40107-005	590±2	10±2	＞90	200-1200	OD5	Φ12.7/Φ25.4	/	Inquire
40107-006	590±3	15±3	＞90	400-1100	OD5	Φ12.7/Φ25.4	/	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40107-007	590±3	20±3	＞90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
412-031	590nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
412-032	590nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
412-033	590nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
412-034	590nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
412-035	590nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
412-036	590nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40107-008	595±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40107-009	595±3	15±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40107-010	600±10	95±5	＞90	400-800	0D5	Φ12.7/Φ25.4	/	Inquire
40107-011	600±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40107-012	600±3	15±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40107-013	600±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40107-014	605±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40107-015	610±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40107-016	612±3	20±3	＞90	200-800	OD6	Φ12.7/Φ25.4	/	Inquire
40107-017	615±2	10±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40107-018	615±3	20±3	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40107-019	615±5	35±5	＞90	200-800	0D4	Φ12.7/Φ25.4	/	Inquire
40108-001	620±2	10±2	＞90	400-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-002	620±5	30±5	＞90	200-800	0D5	Φ12.7/Φ25.4	/	Inquire
413-019	620nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
413-020	620nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
413-021	620nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
413-022	620nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
413-023	620nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
413-024	620nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40108-003	622±3	15±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-004	623±3	15±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-005	625±2	10±2	＞90	200-800	0D5	Φ12.7/Φ25.4	/	Inquire
40108-006	625±3	15±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-007	627±3	15±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-009	630±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40108-008	630±2	8±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-010	630±3	15±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-011	630±3	20±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40108-012	630±8	50±8	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
411-037	630nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-038	630nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-039	630nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-040	630nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-041	630nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-042	630nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40108-013	632±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40108-014	632±3	15±3	＞90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40108-015	632±8	50±8	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40108-016	635±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-017	635±3	15±3	＞90	200-800	0D6	Φ12.7/Φ25.4	/	Inquire
40108-018	635±3	20±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40108-019	635±8	44±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40108-020	635±8	50±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40108-021	640±3	20±3	＞90	400-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-022	643±2	10±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40108-023	645±2	10±2	＞90	200-1150	0D4	Φ12.7/Φ25.4	/	Inquire
40108-024	645±3	15±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40108-025	645±5	35±5	＞90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
40108-026	645±5	40±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-001	650±10	160±10	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40109-002	650±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-003	650±3	15±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-004	650±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-005	650±5	30±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-006	650±5	35±5	＞90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
40109-007	650±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
413-025	650nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
413-026	650nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
413-027	650nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
413-028	650nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
413-029	650nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
413-030	650nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40109-008	652±2	12±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-009	653±3	20±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40109-010	653±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-011	655±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-012	655±3	20±3	＞90	400-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40109-013	655±5	40±5	＞90	300-950	0D4	Φ12.7/Φ25.4	/	Inquire
40109-014	656±10	100±10	＞90	200-1400	0D4	Φ12.7/Φ25.4	/	Inquire
40109-015	656±3	15±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-016	656±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-017	658±5	40±5	＞90	300-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40109-018	658±8	60±8	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-020	660±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-019	660±2	10±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-021	660±2	12±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40109-022	660±3	20±3	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40109-023	660±5	30±5	＞90	300-950	0D4	Φ12.7/Φ25.4	/	Inquire
40109-024	660±5	35±5	＞90	400-800	0D4	Φ12.7/Φ25.4	/	Inquire
40109-025	660±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-026	663±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-028	665±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40109-027	665±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40109-029	665±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-030	666±10	140±10	＞90	350-700	OD1	Φ12.7/Φ25.4	/	Inquire
40109-031	668±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40109-032	670±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40109-033	670±3	15±3	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40109-034	670±3	20±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40109-035	670±5	38±5	＞90	400-800	0D4	Φ12.7/Φ25.4	/	Inquire
40109-036	670±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
411-043	670nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-044	670nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-045	670nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-046	670nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-047	670nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-048	670nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
411-059	673nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
40110-001	675±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-002	675±3	15±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40110-003	675±5	25±5	＞90	300-950	0D5	Φ12.7/Φ25.4	/	Inquire
40110-004	675±5	40±5	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40110-005	680±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40110-006	680±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-007	680±5	25±5	＞90	300-900	0D5	Φ12.7/Φ25.4	/	Inquire
40110-008	680±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-009	680±5	34±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-010	680±5	40±5	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40110-011	682±3	15±3	＞90	200-800	0D6	Φ12.7/Φ25.4	/	Inquire
40110-012	685±5	30±5	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40110-013	685±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-014	690±3	20±3	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40110-015	690±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-016	690±8	45±8	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40110-017	695±3	20±3	＞90	400-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40110-018	695±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-019	700±2	10±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-020	700±3	17±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40110-021	700±3	20±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-022	700±5	25±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40110-023	700±5	40±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
411-049	700nm	10nm	＞50	200 ~1200nm	≥OD4	6mm	4mm	Inquire
411-050	700nm	10nm	＞50	200 ~1200nm	≥OD4	8mm	6mm	Inquire
411-051	700nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	6mm	Inquire
411-052	700nm	10nm	＞50	200 ~1200nm	≥OD4	10mm	7mm	Inquire
411-053	700nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
411-054	700nm	10nm	＞50	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40110-024	705±2	12±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40110-025	710±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40110-026	710±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-027	718±3	25±3	＞90	200-800	0D6	Φ12.7/Φ25.4	/	Inquire
40110-028	720±3	12±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-029	725±3	13±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-030	730±2	10±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-031	735±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40110-032	735±8	90±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-001	740±10	290±10	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-002	740±2	12±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-003	740±5	28±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-004	745±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40111-005	745±3	20±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40111-006	748±2	12±2	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40111-007	748±3	20±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40111-008	750±10	340±10	＞90	300-900	OD4	Φ12.7/Φ25.4	/	Inquire
40111-009	750±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40111-010	760±10	330±10	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-011	760±2	12±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-012	760±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-013	760±8	50±8	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-014	765±8	50±8	＞90	400-800	OD4	Φ12.7/Φ25.4	/	Inquire
40111-015	766±2	10±2	＞90	200-1150	0D4	Φ12.7/Φ25.4	/	Inquire
40111-016	770±2	12±2	＞90	400-1100	0D5	Φ12.7/Φ25.4	/	Inquire
411-060	777nm	10nm	＞50	200 ~1200nm	≥OD4	12mm	8mm	Inquire
40111-017	780±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-018	780±3	20±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-019	785±0.5	3±0.5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-020	785±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-021	790±3	15±3	＞90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40111-022	790±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-023	795±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-024	795±3	15±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-025	795±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-026	795±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-027	800±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40111-028	800±3	20±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40111-029	800±5	25±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40111-030	804±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-031	804±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-032	805±2	12±2	＞90	300-900	0D5	Φ12.7/Φ25.4	/	Inquire
40111-033	805±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40111-034	805±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40111-035	805±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-001	808±2	10±2	＞90	200-1150	OD4	Φ12.7/Φ25.4	/	Inquire
40112-002	808±3	15±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-003	808±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-004	808±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
414-019	808nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
414-020	808nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
414-021	808nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
414-022	808nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
414-023	808nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
414-024	808nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40112-005	810±2	11±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-006	810±3	20±3	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40112-007	810±5	30±5	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40112-008	813±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-009	813±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-010	815±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-011	815±5	30±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-012	815±5	35±5	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40112-013	820±10	200±10	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-014	820±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-015	820±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-016	825±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-017	825±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-018	830±2	10±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-019	830±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-020	835±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-021	840±3	20±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-022	840±8	50±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-023	845±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-024	845±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-025	850±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-026	850±3	10±2	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-027	850±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-028	850±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-029	850±8	50±8	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40112-030	850±8	60±8	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-031	855±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40112-032	855±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40112-033	855±8	50±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-001	860±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-002	860±5	40±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-003	860±8	50±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-004	865±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-005	865±5	25±5	＞90	200-1100	OD5	Φ12.7/Φ25.4	/	Inquire
40113-006	865±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-007	870±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-008	870±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-009	870±5	40±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-010	875±2	10±2	＞90	200-1400	0D4	Φ12.7/Φ25.4	/	Inquire
40113-011	875±5	40±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-012	880±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-013	880±5	40±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire

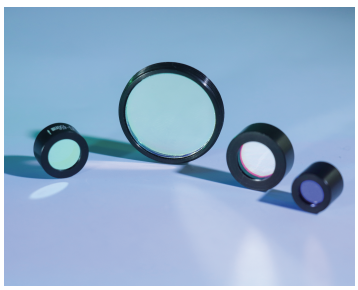
Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40113-014	885±2	10±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-015	885±3	15±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-016	885±5	40±5	＞90	300-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40113-017	890±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-018	890±5	40±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-019	895±3	15±3	＞90	700-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40113-020	900±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-021	900±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-022	900±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-023	905±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-024	905±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-025	910±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-026	910±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-027	915±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-028	915±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-029	920±10	195±10	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-030	920±15	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-031	920±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-032	920±8	80±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-033	925±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-034	925±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-035	930±3	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40113-036	930±3	20±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40113-037	930±5	30±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-038	935±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40113-039	940±2	12±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-040	940±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40113-041	940±8	50±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-001	945±2	10±2	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-002	945±3	20±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40114-003	945±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-004	950±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-005	950±3	20±3	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-006	950±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-007	950±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-008	950±8	50±8	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-009	955±5	30±5	＞90	400-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-010	955±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-011	958±3	15±3	＞90	200-1100	0D5	Φ12.7/Φ25.4	/	Inquire
40114-012	960±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-013	965±3	16±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-014	965±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-015	970±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-016	970±3	20±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-017	970±5	30±5	＞90	400-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-018	970±8	80±8	＞90	200-1150	OD4	Φ12.7/Φ25.4	/	Inquire
40114-019	975±2	10±2	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-020	975±5	30±5	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-021	980±3	20±3	＞90	200-1150	0D4	Φ12.7/Φ25.4	/	Inquire
40114-022	980±5	30±5	＞90	400-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40114-023	980±5	40±5	＞90	300-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-024	985±5	40±5	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-025	990±3	15±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-026	990±5	30±5	＞90	400-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-027	990±5	40±5	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40114-028	994±5	25±5	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40114-029	1000±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-030	1000±3	15±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire

Product List of Bandpass Filters

code	Central Wavelength (nm)	Bandwidth (nm)	Peak Transmission （%）	Blocking Range （nm）	Optical Density	Diameter,mounted (mm)	Aperture	Price
40114-031	1005±3	20±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40114-032	1010±5	40±5	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-033	1015±3	20±3	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-034	1015±5	30±5	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-035	1015±5	40±5	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40114-036	1022±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40114-037	1025±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40114-038	1030±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40114-039	1040±2	10±2	＞90	200-1200	0D5	Φ12.7/Φ25.4	/	Inquire
40114-040	1045±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40115-001	1050±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40115-002	1053±2	10±2	＞90	200-1200	OD4	Φ12.7/Φ25.4	/	Inquire
40115-003	1054±3	17±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40115-004	1058±3	20±3	＞90	400-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40115-005	1060±3	15±3	＞90	300-900	0D4	Φ12.7/Φ25.4	/	Inquire
40115-006	1064±2	10±2	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40115-007	1064±3	17±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40115-008	1064±3	20±3	＞90	200-1200	0D4	Φ12.7/Φ25.4	/	Inquire
414-025	1064nm	10nm	＞80	200 ~1200nm	≥OD4	6mm	4mm	Inquire
414-026	1064nm	10nm	＞80	200 ~1200nm	≥OD4	8mm	6mm	Inquire
414-027	1064nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	6mm	Inquire
414-028	1064nm	10nm	＞80	200 ~1200nm	≥OD4	10mm	7mm	Inquire
414-029	1064nm	10nm	＞80	200 ~1200nm	≥OD4	12mm	8mm	Inquire
414-030	1064nm	10nm	＞80	200 ~1200nm	≥OD4	15mm	12mm	Inquire
40115-009	1070±2	10±2	＞90	400-1200	0D4	Φ12.7/Φ25.4	/	Inquire
40115-010	1070±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40115-011	1075±2	10±2	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40115-012	1080±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40115-013	1085±3	20±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40115-014	1090±3	15±3	＞90	200-1100	OD4	Φ12.7/Φ25.4	/	Inquire
40115-015	1090±3	20±3	＞90	200-1100	0D4	Φ12.7/Φ25.4	/	Inquire
40115-016	1275±8	70±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-017	1475±8	70±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-018	1520±8	75±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-019	1535±8	70±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-020	1540±8	60±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-021	1540±8	75±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-022	1545±8	80±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-023	1550±2	10±2	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-026	1550±8	120±8	＞90	200-2500	0D4	Φ12.7/Φ25.4	/	Inquire
40115-025	1550±8	60±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-024	1550±8	60±8	＞90	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-027	1655±3	15±3	＞75	200-2000	0D4	Φ12.7/Φ25.4	/	Inquire
40115-028	1697±3	15±3	＞75	200-2000	OD4	Φ12.7/Φ25.4	/	Inquire
40115-029	220±2	10±2	＞13	200-2000	OD3	Φ12.7/Φ25.4	/	Inquire
40115-030	3065±20	145±20	＞85	200-11000	0D3	Φ12.7/Φ25.4	/	Inquire
40115-031	3900±30	315±30	＞80	200-11000	0D3	Φ12.7/Φ25.4	/	Inquire
40115-032	4260±30	200±20	＞85	200-11000	0D3	Φ12.7/Φ25.4	/	Inquire
40115-033	5000±40	235±20	＞85	200-11000	0D3	Φ12.7/Φ25.4	/	Inquire
40115-034	5050±40	340±40	＞85	200-11000	OD3	Φ12.7/Φ25.4	/	Inquire
40115-035	10500±50	275±20	＞80	200-15000	0D3	Φ12.7/Φ25.4	/	Inquire

Longpass Filters

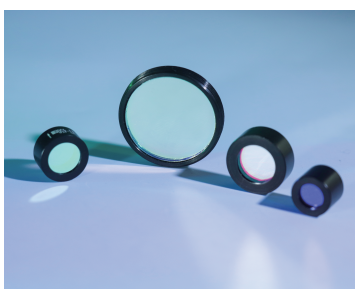


Longpass (LP) filters are transparent optical elements used in various fields of science and technologies to transmit longer wavelengths of light in selection than the cut-on wavelength while blocking or attenuating shorter wavelengths. Longpass filters operate on the principle of spectral filtering, a process in which specific wavelengths of light are allowed to pass through while blocking others. Longpass filters form a crucial part of applications ranging from photographic and spectroscopes to telecommunications and astronomical.

Longpass filters are utilized in instruments like spectrophotometers and fluorescence microscopes, where the filters help isolate the emission or absorption spectra of specific compounds, separating and analyzing light based on its wavelength. This aids in scientific research, including the identification of chemical substances and the investigation of molecular interactions.

Hangzhou Shalom EO offers stocked and custom long pass filters. our long pass filters are available in various dimensions, shapes, and coating options, providing flexible options to meet your unique application needs. Each LP Filter is crafted with precision and care, ensuring steep cut-on slopes and consistent transmission of longer wavelengths while blocking shorter ones with effective strength, enabling clear imaging and analysis and securing durabilities under harsh working conditions at the same time.

Longpass Filters (Standard)



- Unique Visual Effects, Great Steepness of the Cut-on Slope
- Isolating Specific Spectral Regions For Precise Analysis.
- Tech Support For Customization
- Combination with Shortpass Filter for Custom Bandpass Wavelength Ranges
- Applications: Photography, Spectroscopy, Telecommunications, Astronomy, etc

A Longpass Filter is a transparent optical element designed to transmit light of longer wavelengths in selection than the cut-on wavelength while blocking or attenuating shorter wavelengths. Long pass filters provide flexible control over the light spectrum, enhancing image qualities and facilitating various optical processes. Their wide transmission bands and versatile functions make them essential components in a wide range of optical applications, such as photography, spectroscopes, microscopes, and sensor technologies.

This page specifies Hangzhou Shalom EO's off-the-shelf longpass filters, while we also offer tech support and design service for custom longpass optical filters, where our extensive range of dimensions, and transmission wavelengths cater to your requirements. The blocking wavelength ranges of our long-pass filters extend from UV to IR, accommodating numerous spectral operations. Our long-pass filters offer great steepness of the transition between transmission and blocking regions. Exploiting advanced production techniques and rigorous inspection procedures, we ensure optimized durabilities and exceptional optical transmission for our users across various industries.

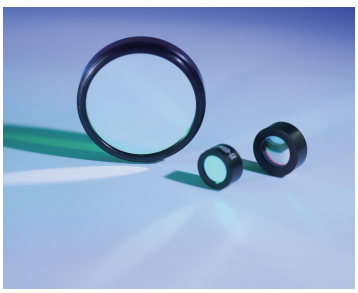
Product List of Longpass Filters (standard)

Code	Types	Transmission Wavelength Range	Transmission Rate	Rejection Wavelength Range	Optical Density	Cut-on Wavelength	Price	Delivery
40202-001	Long Pass Filter	255-370nm	> 85% average	190-370nm	> OD3	250nm±3	Inquire	Inquire
40202-002	Long Pass Filter	275-1100	> 90% average	190-250	> OD3	260nm±3	Inquire	Inquire
40202-003	Long Pass Filter	340-1100	> 90% average	190-308	> OD3	320nm±3	Inquire	Inquire
40202-004	Long Pass Filter	370-1100	> 90% average	190-350	> OD3	355nm±3	Inquire	Inquire

Product List of Longpass Filters (standard)

Code	Types	Transmission Wavelength Range	Transmission Rate	Rejection Wavelength Range	Blocking Depth	Cut-on Wavelength	Price	Delivery
40202-005	Long Pass Filter	385-1100	> 90% average	190-365	> OD3	370nm±3	Inquire	Inquire
40202-006	Long Pass Filter	405-2000	> 90% average	200-388	> OD6	395±2nm	Inquire	Inquire
40202-007	Long Pass Filter	420-1200	> 90% average	200-375	> OD4	/	Inquire	Inquire
40202-008	Long Pass Filter	420-1100	> 90% average	190-400	> OD3	410nm±3	Inquire	Inquire
40202-009	Long Pass Filter	445-1200	> 90% average	200-405	> OD4	/	Inquire	Inquire
40202-010	Long Pass Filter	435-1100	> 90% average	190-420	> OD3	430nm±3	Inquire	Inquire
40202-011	Long Pass Filter	465-1100	> 90% average	190-435	> OD3	450nm±3	Inquire	Inquire
40202-012	Long Pass Filter	470-1200	> 90% average	200-430	> OD4	/	Inquire	Inquire
40202-013	Long Pass Filter	495-1200	> 90% average	200-455	> OD4	/	Inquire	Inquire
40202-014	Long Pass Filter	500-1100	> 90% average	190-460	> OD3	480nm±3	Inquire	Inquire
40202-015	Long Pass Filter	508-1100	> 90% average	190-458	> OD3	500nm±3	Inquire	Inquire
40202-016	Long Pass Filter	520-1200	> 90% average	200-480	> OD4	/	Inquire	Inquire
40202-017	Long Pass Filter	545-1200	> 90% average	200-505	> OD4	/	Inquire	Inquire
40202-018	Long Pass Filter	545-1100	> 90% average	190-510	> OD3	530nm±3	Inquire	Inquire
40202-019	Long Pass Filter	555-1100	> 90% average	190-535	> OD3	550nm±3	Inquire	Inquire
40202-020	Long Pass Filter	575-1200	> 90% average	200-530	> OD4	/	Inquire	Inquire
40202-021	Long Pass Filter	600-1200	> 90% average	200-550	> OD4	/	Inquire	Inquire
40202-022	Long Pass Filter	625-1100	> 90% average	190-590	> OD3	610nm±3	Inquire	Inquire
40202-023	Long Pass Filter	625-1200	> 90% average	200-570	> OD4	/	Inquire	Inquire
40202-024	Long Pass Filter	650-1200	> 90% average	200-595	> OD4	/	Inquire	Inquire
40202-025	Long Pass Filter	665-1100	> 90% average	190-625	> OD3	650nm±3	Inquire	Inquire
40202-026	Long Pass Filter	675-1200	> 90% average	200-620	> OD4	/	Inquire	Inquire
40202-027	Long Pass Filter	700-1200	> 90% average	200-645	> OD4	/	Inquire	Inquire
40202-028	Long Pass Filter	700-1100	> 92% average	190-675	> OD3	690nm±3	Inquire	Inquire
40202-029	Long Pass Filter	725-1200	> 90% average	200-670	> OD4	/	Inquire	Inquire
40202-030	Long Pass Filter	750-1200	> 90% average	200-695	> OD4	/	Inquire	Inquire
40202-031	Long Pass Filter	775-1200	> 90% average	200-720	> OD4	/	Inquire	Inquire
40202-032	Long Pass Filter	765-1100	> 90% average	190-735	> OD3	750nm±3	Inquire	Inquire
40202-033	Long Pass Filter	800-1200	> 90% average	200-745	> OD4	/	Inquire	Inquire
40202-034	Long Pass Filter	825-1200	> 90% average	400-770	> OD4	/	Inquire	Inquire
40202-035	Long Pass Filter	825-1100	> 90% average	190-795	> OD3	810nm±3	Inquire	Inquire
40202-036	Long Pass Filter	820-1200	> 95% average	200-800	> OD6	810±2nm	Inquire	Inquire
40202-037	Long Pass Filter	850-1200	> 90% average	400-795	> OD4	/	Inquire	Inquire
40202-038	Long Pass Filter	875-1200	> 90% average	400-820	> OD4	/	Inquire	Inquire
40202-039	Long Pass Filter	900-1200	> 90% average	400-845	> OD4	/	Inquire	Inquire
40202-040	Long Pass Filter	905-1100	> 90% average	190-870	> OD3	890nm±3	Inquire	Inquire
40202-041	Long Pass Filter	930-1200	> 90% average	400-870	> OD4	/	Inquire	Inquire
40202-042	Long Pass Filter	955-1200	> 90% average	400-895	> OD4	/	Inquire	Inquire
40202-043	Long Pass Filter	960-1100	> 95% average	190-935	> OD3	940nm±3	Inquire	Inquire
40202-044	Long Pass Filter	980-1200	> 90% average	400-910	> OD4	/	Inquire	Inquire
40202-045	Long Pass Filter	980-1200	≥95% average	200-940	> OD6	960±2nm	Inquire	Inquire
40202-046	Long Pass Filter	1010-1800	> 90% average	400-935	> OD4	/	Inquire	Inquire
40202-047	Long Pass Filter	1040-1800	> 90% average	400-960	> OD4	/	Inquire	Inquire
40202-048	Long Pass Filter	1010-2000	⩾ 98% average	200-990	> OD6	1000±2nm	Inquire	Inquire
40202-049	Long Pass Filter	1070-1800	> 90% average	400-985	> OD4	/	Inquire	Inquire
40202-050	Long Pass Filter	1100-1800	> 90% average	400-1010	> OD4	/	Inquire	Inquire
40202-051	Long Pass Filter	1130-1800	> 90% average	400-1035	> OD4	/	Inquire	Inquire
40202-052	Long Pass Filter	1160-1800	> 90% average	400-1060	> OD4	/	Inquire	Inquire
40202-053	Long Pass Filter	1150-1700	⩾ 98% average	200-1130	> OD5	1140±2nm	Inquire	Inquire
40202-054	Long Pass Filter	1210-2000	⩾ 98% average	200-1195	> OD4	1200±2nm	Inquire	Inquire
40202-055	Long Pass Filter	1310-1800	⩾ 98% average	700-1285	> OD6	1300±2nm	Inquire	Inquire
40202-056	Long Pass Filter	1400-2000	⩾ 98% average	700-1388	> OD4	1398±2nm	Inquire	Inquire

Shortpass Filters



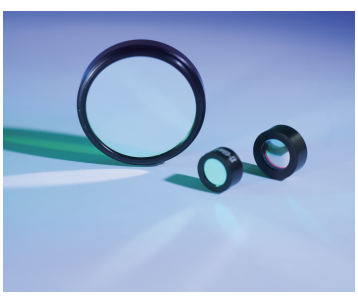
Shortpass Filters, also called Shortpass Edge Filters, are optical elements that transmit wavelengths shorter than a specific wavelength (the cut-off wavelength) of the filter. The thin-film coatings or absorptive glass are engineered to interact with the incoming light and provide a cut-off slope establishing the transition between a region of high rejection and a region of high transmission. Shortpass filters consist of two parts in main: a substrate and a stack of dielectric thin films. The substrate acts as a support for the dielectric stack and is often made of materials like glass or fused silica. The dielectric stack comprises alternating thin films of high and low refractive index coating materials, such as titanium dioxide and silicon dioxide.

When light enters a shortpass filter, it encounters the dielectric stack. The thickness and refractive indices of the dielectric thin films are designed to create interference patterns. This interference causes destructive interference for longer wavelengths, resulting in their reflection or absorption, while shorter wavelengths experience constructive interference and are transmitted through the filter.

One of the most crucial subcategories of shortpass filters is UV shortpass filters, designed to transmit ultraviolet (UV) light while blocking longer wavelengths. These filters are used in various applications, such as fluorescence microscopy, UV spectroscopy, and UV imaging. Shortpass filters find extensive usage in biomedical imaging, astronomy, and industrial applications.

Hangzhou Shalom EO utilizes vacuum coating facilities, the TiO2 and SiO2 coatings are formed in a circulating evaporation course. We offer stocked and custom shortpass filters. Regarding the stocked shortpass filters, a wide transmission wavelength range extending from UV to IR spectral regions is available. Regarding the custom shortpass filters, all specifications could be tailored upon your request.

Shortpass Filters (Custom)

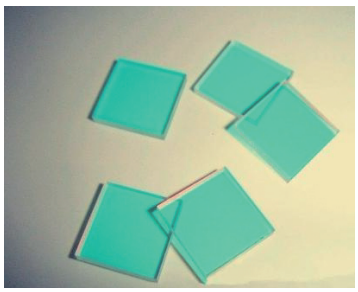


- Broad Transmission and Rejection Ranges
- Sharp Cutoff Slope for Effective Spectral Discrimination
- Combination with Long Pass Filter for Custom Bandpass Ranges
- Vacuum Coating Facilities
- Applications: Microscopy, Spectroscopy, Biomedical Imaging, Laser Systems, etc.

Shortpass Filters, also named Shortpass Edge Filters, are a kind of optical bandpass filters that transmit wavelengths shorter than a specific wavelength (the cut-off wavelength) of the filter. The thin-film coatings or absorptive glass are engineered to interact with the incoming light and provide a cut-off slope establishing the transition between a region of high rejection and a region of high transmission. Shortpass filters represent a fundamental component within the realm of optical engineering, offering precise control over the transmission of light across different wavelengths.

Hangzhou Shalom EO supplies Custom Shortpass Filters. At its core, the selective behavior of a short pass filter is achieved through the strategic implementation of specialized coatings or materials with distinct optical properties. Shalom EO utilizes vacuum coating facilities, the TiO2 and SiO2 coatings are formed in a circulating evaporation course, offering exceptional steepness of the transition between transmission and blocking regions. Our short pass filters empower users with excellent optical results in various applications including spectroscopy, fluorescence microscopy, sensor technologies, etc.

Shortpass Filters (Standard)



- Broad Transmission and Rejection Ranges
- Sharp Slope for Effective Spectral Discrimination
- Combine with Longpass Filter for Custom Bandpass Ranges
- Avg. >90% transmission and Avg. >OD4 rejection
- Cut-off wavelength 420-1200nm
- Applications: Microscopy, Spectroscopy, Biomedical Imaging, laser systems, etc.

Shortpass Filters, also called Shortpass Edge Filters, are optical elements that transmit wavelengths shorter than a specific wavelength (the cut-off wavelength) of the filter. The thin-film coatings or absorptive glass are engineered to interact with the incoming light and provide a cut-off slope establishing the transition between a region of high rejection and a region of high transmission.

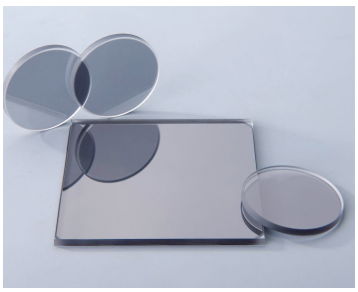
One of the most crucial subcategories of shortpass filters is UV shortpass filters, designed to transmit ultraviolet (UV) light while blocking longer wavelengths. These filters are used in various applications, such as fluorescence microscopy, UV spectroscopy, and UV imaging. Short-pass filters also find extensive usage in biomedical imaging, astronomy, and industrial applications.

Hangzhou Shalom EO utilizes vacuum coating facilities, the TiO2 and SiO2 coatings are formed in a circulating evaporation course. This page highlights our stocked short-pass filters, the short-pass filters feature steep cut-off slopes, and the cut-off wavelength short-pass filters range from 420-1200nm, spanning the UV to IR spectral region, accommodating numerous spectral operations. with a >90% high transmission rate in the transmission zone and >OD4 rejection rate in the rejection zone.

Product List of Shortpass Filters (standard)

Code	Types	Transmission Wavelength Range	Transmission Rate	Rejection Wavelength Range	Optical Density	Cut-off Wavelength	Price	Delivery
40302-001	Short Pass Filter	320-370	> 60% average	420-1100	> OD4		Inquire	Inquire
40302-002	Short Pass Filter	420-520	> 90% average	550-1100	> OD4		Inquire	Inquire
40302-003	Short Pass Filter	420-570	> 90% average	630-1100	> OD4		Inquire	Inquire
40302-004	Short Pass Filter	420-630	> 90% average	680-1100	> OD4		Inquire	Inquire
40302-005	Short Pass Filter	420-635	> 90% average	350-1100	> OD3	650nm±5	Inquire	Inquire
40302-006	Short Pass Filter	440-630	> 90% average	350-405&	> OD3	650nm±5	Inquire	Inquire
40302-007	Short Pass Filter			680-1100			Inquire	Inquire
40302-008	Short Pass Filter	410-650	> 90% average	350-1100	> OD3	680nm±5	Inquire	Inquire
40302-009	Short Pass Filter	410-680	> 90% average	190-385&	> OD3	700nm±5	Inquire	Inquire
40302-010	Short Pass Filter			750-1100			Inquire	Inquire
40302-011	Short Pass Filter	420-680	> 90% average	730-1100	> OD4		Inquire	Inquire
40302-012	Short Pass Filter	420-720	> 90% average	780-1100	> OD4		Inquire	Inquire
40302-013	Short Pass Filter	420-770	> 90% average	830-1100	> OD4		Inquire	Inquire
40302-014	Short Pass Filter	420-820	> 90% average	880-1100	> OD4		Inquire	Inquire
40302-015	Short Pass Filter	420-870	> 90% average	930-1100	> OD4		Inquire	Inquire
40302-016	Short Pass Filter	420-920	> 90% average	980-1100	> OD4		Inquire	Inquire
40302-017	Short Pass Filter	400-950	> 90% average	1000-1200	> OD3	960nm±5	Inquire	Inquire
40302-018	Short Pass Filter	420-970	> 90% average	1040-1200	> OD4		Inquire	Inquire

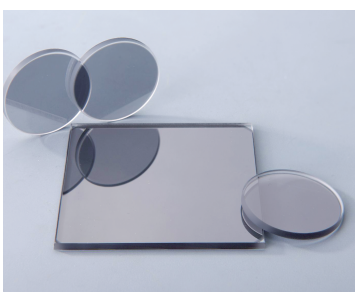
Neutral Density Filters



Neutral Density Filters (ND filters) are optical filters that transmit light with even attenuation. A neutral density filter reduces the intensities of a portion of the spectrum, introducing no changes in the hue of color rendition. This attenuation behavior of density filters is achieved through absorption, reflection, or a combination of both. The optical properties of an ND filter depend on in main the Optical Density (OD) of the filter. Neutral density filters provide users with the freedom to manipulate the intensities of light without changing the spectral characteristics and serve as a useful component to prevent excessive light exposure. The applications of neutral density (ND) filters include industrial imaging, machine vision, spectroscopes, lasers, etc., where overexposure of light is harmful to camera sensors or other optical components, or when excessive light will cause inaccurate results in photometers.

Hangzhou Shalom EO offers a wide selection of stock and custom Neutral Density Filters. Regarding the homogeneous neutral density filters, the standard operation spectra options include Ultraviolet (UV) (250-380nm), Visible spectra (400-700nm), or Visible and Near Infrared (V&NIR) (400-1100nm), Infrared (IR) (2200-15000nm), while other coatings, dimensions, and shapes can be tailored upon request. The substrate materials include BK7, colored filtering glass, UV fused Silica or Silicon, Germanium, or custom. Crafted with precision engineering and superior materials, our ND Filters offer unparalleled control over light intensities without compromising spectral integrities. Besides, we also provide Continuously Variable ND filters that come in two kinds, the Circular Variable Neutral Density Filters offer flexible adjustment of the optical density through rotation about the center axis, and the Rectangular Variable Neutral Density Filters allow linear change of the optical density across the length of the filter. Crafted with precision engineering and superior materials, our ND Filters offer unparalleled control over light intensities without compromising spectral integrities.

UV Neutral Density Filters (250-380nm)



- Precise control of light intensities excellent for photographic, machine vision, lasers, etc.
- UV fused silica substrates
- Providing protection from excessive light for camera sensors, photometers, etc.
- ND filters in rectangular or round shapes and custom sizes are available

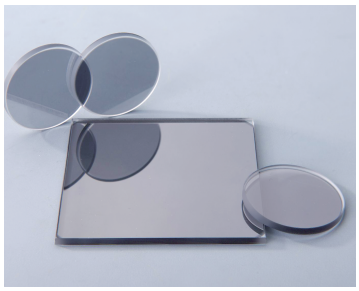
Neutral Density Filters, also known as ND Filters, are a kind of optical filter that transmit a portion of the spectrum with even attenuation. This attenuation is achieved through absorption, reflection, or a combination of both, without introducing color shifts or distortions to the transmitted light. ND filters offer precise control over light intensities without altering their spectral characteristics, which renders them useful in imaging or laser applications where extra light can be detrimental or undesirable to camera sensors or other optical components. ND Filters are also critical components to maintain precise outcomes in photometers through the rejection of excessive light.

Hangzhou Shalom EO offers various Neutral Density Filters for Ultraviolet (UV), Visible, or Infrared (IR) applications, accommodating operations in different spectra. This page specifies our Custom UV Neutral Density Filters with a transmission wavelength range of 250-380nm. Crafted with precision engineering and superior materials, our ND Filters offer unparalleled control over light intensities without compromising spectral integrities.

Specifications:

Materials	UV Fused Silica	Size	customized
Optical Density Range	OD 0.1 to 3	Wavelength Range	250nm to 380nm
Aperture	>90%	Transmitted Wavefront Distortion	<λ/4@633nm
Parallelism	<30 arc second	Surface Quality	40/20 S/D

VIS Neutral Density Filters (400-700nm)



- Precise control of light intensities excellent for photographic, machine vision, lasers, etc.
- N-BK7 substrates
- Providing protection from excessive light for camera sensors, photometers, etc.
- ND filters in rectangular or round shapes and custom sizes are available

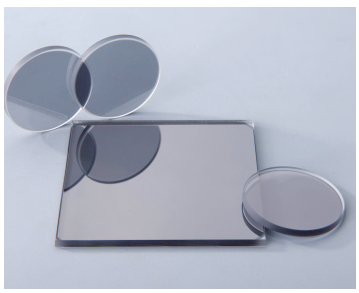
Neutral Density Filters, also known as ND Filters, are a kind of optical filter that transmit a portion of the spectrum with even attenuation. This attenuation is achieved through absorption, reflection, or a combination of both, without introducing color shifts or distortions to the transmitted light. ND filters offer precise control over light intensities without altering their spectral characteristics, which renders them useful in industrial imaging, machine vision, spectroscopes, lasers, etc., where overexposure of light is harmful to camera sensors or other optical components, or when excessive light will cause inaccurate results in photometers. ND Filters are also critical components to maintain precise outcomes in photometers through the rejection of excessive light.

Hangzhou Shalom EO offers various Neutral Density Filters for Ultraviolet (UV), Visible, or Infrared (IR) applications, accommodating operations in different spectra. This page specifies our Custom VIS Neutral Density Filters with a transmission wavelength range of 400-700nm. Crafted with precision engineering and superior materials, our ND Filters offer unparalleled control over light intensities without compromising spectral integrities.

Specifications:

Materials	BK7	Size	customized
Optical Density Range	OD 0.1 to OD 3.0	Wavelength Range	400nm to 700nm
Aperture	>90%	Transmitted Wavefront Distortion	<λ/4@633nm
Parallelism	<30 arc second	Surface Quality	40/20 S/D

VIS-NIR Neutral Density Filters (350-1100nm)



- Transmission Spectral range from VIS to NIR (350-1100nm)
- Transmission rates from 0.1% to 80%
- Precise control of light intensities excellent for photographic, machine vision, lasers, etc.
- Substrate materials: K9, B270, SCHOTT D263T, Borofloat, Quartz
- Providing protection from excessive light for camera sensors, photometers, etc.

Neutral Density Filters, also known as ND Filters, are a kind of optical filter that transmit a portion of the spectrum with even attenuation. This attenuation is achieved through absorption, reflection, or a combination of both, without introducing color shifts or distortions to the transmitted light.

Hangzhou Shalom EO offers various Neutral Density Filters for Ultraviolet (UV), Visible, or Infrared (IR) applications, accommodating operations in different spectra. Crafted with precision engineering and superior materials, our ND Filters offer unparalleled control over light intensities without compromising spectral integrities. This page highlights Shalom EO's standard VIS-NIR (350-1100nm) Neutral Density Filters, we provide multiple options of transmission rates from 0.1% to 80%, and the ND filter substrates could be made from various materials including K9, B270, SCHOTT D263T, Borofloat, Quartz. While custom VIS-NIR (350-1100nm) ND filters made of BK7 or colored glass substrates are also available.

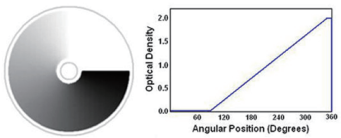
Specifications:

Materials	BK7 or Colored Glass	Size	customized
Optical Density Range	OD 0.1 to 3	Wavelength Range	400nm to 1100nm
Aperture	>90%	Transmitted Wavefront Distortion	<λ/4@633nm
Parallelism	<30 arc second	Surface Quality	40/20 S/D

Product List of VIS-NIR Neutral Density Filters (350-1100nm)

Code	Material	Transmission Wavelength Range	Transmission Rate	Surface Quality
40404-001	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	0.10%	60/40 S/D
40404-002	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	3%	60/40 S/D
40404-003	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	10%	60/40 S/D
40404-004	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	20%	60/40 S/D
40404-005	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	30%	60/40 S/D
40404-006	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	40%	60/40 S/D
40404-007	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	50%	60/40 S/D
40404-008	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	70%	60/40 S/D
40404-009	K9,B270,D263T SCHOTT, Borofloat, Quartz)	350-1100nm	80%	60/40 S/D

Circular Variable Neutral Density Filters



- Provide continuously variable, linear attenuation of incident light
- Diameter range 20-200mm, coating area 0-270°
- Substrate materials : BK7 or Fused Silica
- Optical density range options: Max. OD1, Max. OD2, Max. OD3 and Max. OD4
- Wavelength Range: 380 -2000nm (BK7); 250-2500nm (Fused Silica)
- Dual purposed as variable beamsplitter

Circular Variable Neutral Density Filter (ND Filter) is a special kind of neutral density filter that allows the user to adjust the light attenuation as the user rotates the circular variable filter about the center within the coated area of the filter. The optical densities of the circular neutral density have a linear relationship with the rotation angle. A circular variable neutral density filter enables precise adjustment of the power of a transmitted beam to desired ratios.

Hangzhou Shalom EO supplies Circular Variable ND Filters. These continuous variable circular variable neutral density filters offer a convenient measure of adjusting beam attenuation through simple rotation. The outer diameter ranges from 10-200mm, the coating region covers 0-270°, and there are four optical density range options: Max. OD1, Max. OD2, Max. OD3 and Max. OD4. As the optical density increases linearly by the rotation angle, through rotating the circular variable filters, one can manipulate the OD within the chosen maximum of OD1, OD2, OD3, and OD4. In addition, by referencing the angular markings, users can easily set the filter to achieve the desired transmitted beam power. The linear density relationship enables motorized rotation, facilitating precise logarithmic sweeps in transmitted beam power.

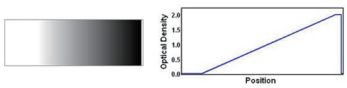
Specifications:

Substrate Materials	BK7, Fused Silica	Outer Diameter	20mm to 200mm
Inner Diameter	7.5mm, 8.0mm and 8.3mm	Outer Diameter Tolerance	+0.0/-0.15mm
Inner Diameter Tolerance	+0.15/-0.0mm	Thickness Tolerance	+/-0.1mm
Parallelism	3′	Linearity	+/-5%
Error of Maximum OD	+/-5%	Surface Quality	80/50 S/D
Coating Area	0 ~ 270°	Design Wavelength Range	380nm to 2000nm (BK7) 250nm to 2500nm (Fused Silica)

Modules or Types:

Code	Out Diameter	Inner Diameter	OD	Substrate
444-001	100	7.5	1	BK7
444-002	100	7.5	2	BK7
444-003	100	7.5	3	BK7
444-004	100	7.5	4	BK7
444-005	50	8.0	1	BK7
444-006	50	8.0	2	BK7
444-007	50	8.0	3	BK7
444-008	50	8.0	4	BK7
444-009	25	8.3	1	BK7
444-010	25	8.3	2	BK7
444-011	25	8.3	3	BK7
444-012	25	8.3	4	BK7
444-013	60	8.3	1	BK7
444-014	60	8.3	2	BK7
444-015	60	8.3	3	BK7
444-016	60	8.3	4	BK7

Rectangular Continuously Variable Neutral Density Filters



- Substrate materials : BK7 or Fused Silica
- Optical density range options: Max.OD1, Max. OD2, Max. OD3, and Max. OD4
- Wavelength Range :380 -2000nm (BK7); 250-2500nm (Fused Silica)
- Standard molds for fast delivery or customized modules available upon request

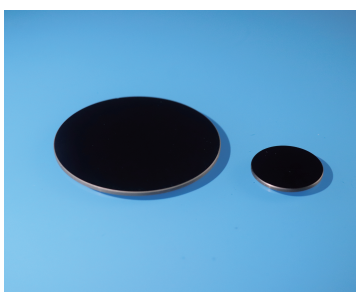
Rectangular Continuously Variable Neutral Density Filters (ND Filters) are a special kind of neutral density filter, the optical densities of a rectangular continuously variable ND filter change linearly across the longest dimension (which is the length) of the filter, allowing precise control over the attenuation through transition within the coated region.

Shalom EO's Rectangular Continuously Variable Neutral Density Filters are precision-engineered to provide precise control over light attenuation for various optical applications. Four maximum optical densities including OD1, OD2, OD3, and OD4 are available. Elevate your optical experiments and applications with our Rectangular Continuously Variable Neutral Density Filters. Whether you need rapid ordering or tailored solutions, these filters from Shalom EO are primed to deliver exceptional light control and precision.

Specifications:

Substrate Materials	BK7, Fused Silica	Thickness Tolerance	+/-0.1mm
Parallelism	3′	Linearity	+/-5%
Error of Maximum OD	+/-5%	Surface Quality	80/50 S/D
Design Wavelength Range	380nm to 2000nm (BK7) 250nm to 2500nm (Fused Silica)		

Infrared Neutral Density Filters

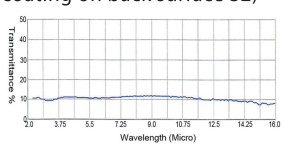


- Reflection type IR ND filters
- Germanium (Ge) substrates and metal alloy coating
- Wide operation wavelength range: optimized at 2.2μm, maximum 15μm
- Custom Optical Density (OD)
- Custom Diameters available

An Infrared Neutral Density Filter is a neutral density filter with even attenuation to the IR spectrum, consisting of a metal alloy coating deposited on a substrate chosen according to the wavelength region of interest. Unlike a complete dielectric or absorption filter, the metallic ND filter utilizes a combination of absorption and reflection to reduce the intensities of light, and the optical densities of the metallic-coated neutral density infrared filters are determined by metal alloy coatings.
Shalom EO offers Infrared Neutral Density Filters comprising metallic coatings deposited upon germanium substrates designed to attenuate radiation over a stunningly wide range in the IR region, the ND coatings are optimized at 2.2 microns and are capable of covering extensive wavelengths up to15 microns.

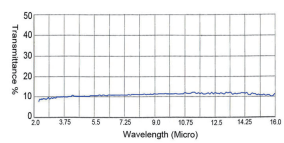
Curves:

1. Transmission of IR ND filters (Germanium, T=10%, BBAR coating on back surface S2)



Curves:

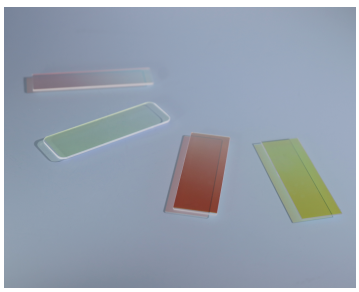
2. Transmission of IR ND filters (Germanium, T=10%, No BBAR coating on back surface S2)



Specifications:

Substrates	Germanium	Diameter Range	Custom
Transmission	10%, 20% or custom	Aperture BBAR Coating on back surface S2	Optional
Dimension Tolerance	±0.2mm	Clear Aperture	+/-0.2mm90% of outside dimension
Surface Quality	80/50 S/D	Flatness	2-4 waves per 25mm
Parallelism	3-5 arc minutes	Mechanical	Unmounted

Colored Glass Absorptive Filters



- High Chemical resistance, High stability and Scratch resistance
- Economic alternative for thin film coated filters
- Multiple modules including band pass, long pass and short pass filters, neutral density filters etc. available
- Chinese made colored glass materials equal to Shott or Hoya are used

Colored glass absorptive filters are a kind of absorptive-type optical filter composed of thin glass substrates doped with metal oxides or other dyes, which impart unique absorption characteristics to the material. When light passes through the filter, the rejected wavelengths are absorbed, while others are transmitted. The main features of Colored glass absorptive filters include cost-friendliness, being Insensitive to the Angle of the incident(AOI) of light, and high chemical resistance and no polarization effect as the dye is impregnated throughout the filter. Having the advantage of isolating a broad range of wavelengths, colored glass absorptive filters do an excellent job in applications requiring the blocking of short wavelengths and transmission of longer wavelengths.

Hangzhou Shalom EO offers colored glass absorptive filters with outstanding spectral selection precision, high durabilities, and stabilities reliable under various conditions and for manifold applications. Our colored glass filter substrates are manufactured using glass materials sourced from Chinese suppliers that are identical to those supplied by SCHOTT or HOYA.

Please note that while our filters offer exceptional performance, it's important to consider their application limitations. Glass filters,might not be optimal for intense light source and high power scenarios. We advise consideration of your specific requirements before making a purchase. For personalized guidance, our team is readily available to assist you.

Our Available Chinese Glass Materials and Their Foreign Equivalents

China	Former USSR	SCHOTT	HOYA	China	Former USSR	SCHOTT	HOYA
			UV-22			BG18	
		WG230				BG25	B-380
BB8	БС12			LB1	3C1	VG9	
BB1	БС3	WG280	UV-28	LB2	3C2	VG11	
BB2	БС4	WG295	UV-30	LB3	3C3		
BB3	БС5	WG320	UV32	LB4	3C6		
BB7	БС10	WG345	UV34	LB6	3C8		
BB5	БС7	WG360	UV36	LB7	ЖЗС1	VB8	G-533
BB6	БС8	GG375	L-38	LB8	ЖЗС4		
JB2	ЖС4	GG400	L-40	LB9	ЖЗС5	VB10	
JB4	ЖС11	GG420	L-42	LB10	ЖЗС6		G-550
JB5	ЖС12	GG455	Y-44	LB11	ЖЗС9		
JB6	ЖС16	GG475	Y-46	LB12	ЖЗС10		
JB7	ЖС17	GG495	Y-48	LB13	ЖЗС12		G545
JB8	ЖС18	GG515	Y-50	LB14	ЖЗС13		
CB3	ОС11	GG530	O-54	LB15	ЖЗС17		
CB4	ОС12	GG550		LB16	ЖЗС18		
CB5	ОС13	GG570	O-56			VG6	
JB7	ЖС17	GG495	Y-48	LB13	ЖЗС12		
HB9	КС10		R-60				
HB10	КС11	RG610		JB1	ЖС3	GG19	
HB11	КС13	RG630	R-62			GG10	
HB12	КС14	RG645	R-64	CB1	ОС5		
HB13	КС15		R-66	CB2	ОС6		
HB14	КС17	RG665		HB1	ИС5		
HB15	КС18		R-68	HB3	ИС8	RG6	
HB16	КС19	RG698	R-70	HB5	ИС13		
		RG715	R-72		ИС2		
			R-76	HWB1	ИКС1		RM-86
		RG780		HWB3	ИКС2	RG7	RM-90
			IR-80	HWB4	ИКС3		
		RG830	IR-83	FB1	ТС1		
			IR-85	FB3	ТС3		
				QB15	С3С14	KG2	HA-50
					С3С16	KG30	HA-30
ZWB1	УфС2	UG11	U-340	HB2	С7	BG20	V-10
ZWB2	УфС3	UG1	U-360				HY-1
ZWB3	УфС1	UG5	U-330				SL-1A
ZB1	ФС1		B-390				L-1B
ZB2	ФС6	BG3				FG6	LB-40
ZB3	ФС7		B-370			BG-34	LB-145
QB1	СС1					FG3	LB-165
QB2	СС2		B-410				LB-200
QB3	СС4					FG18	LA-20
QB4	СС5					FG16	LA-80
QB5	СС8		B-440				LA-100
QB9	С3С3					FG15	LA-120
QB10	С3С5						LA-150
QB11	С3С7	BG14		AB10	HC12	NG1	ND-0
QB12	С3С8		B-460	AB9	HC11	NG9	ND-03
QB13	С3С9			AB8	HC10	NG3	
QB16	С3С15			AB3	HC3		
QB17	С3С16			AB7	HC9	NG4	ND13
QB18	С3С17			AB6	HC8	NG5	ND-25
QB19	С3С19			AB2	HC2		
QB21	С3С21	BG38		AB5	HC7	NG11	ND-50
		BG7	B-480	AB1	HC1		
		BG12		AB4	HC6	NG11	ND-70

Dichroic Filters

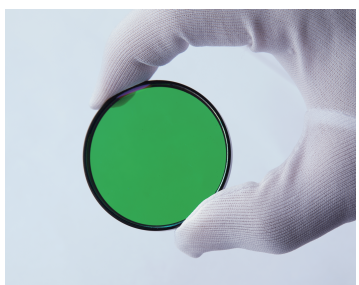


Dichroic Filters, or Interference Filters are precise color filters that transmit light from a narrow range of colors while reflecting the other unwanted portion. Dichroic filters split light into two components, one component is transmitted and one is reflected. Using a Dichroic filter, a user can select spectral regions of interest and decide whether the separated light spectrum should be utilized or dumped. Dichroic filters function based on the principles of interference, where dielectric thin film coatings are deposited on the filter substrates to obtain constructive interference for certain wavelengths of light and destructive interference for others. Because the unwanted portion of the light is reflected instead of absorbed by the filters, dichroic filters can endure light sources with higher intensities.

Hangzhou Shalom EO offers a wide selection of Dichroic Filters including Longpass Dichroic Filters, Shortpass Dichroic Filters, Dichroic filters for RGB light show, Laser line Dichroic filters (various HR or HT coatings at specific wavelengths), and other categories encompassing dichroic bandpass filters, dichroic band stop (notch) filters.

A Multi-layer thin film coating technique is incorporated into the production process to ensure low absorption, high reflection/exceptional transmission, achieving high spectral selection strength and efficiencies, allowing for precise manipulation of light with minimal loss. In addition, our dichroic filters offer excellent durability and stability, making them suitable for use in demanding environments. The modules could be mounted or unmounted, and besides stock dichroic filters custom versions are available.

Longpass Dichroic Filters



- High Stability and Sharp cut-on slopes
- High Reflection/Low absorption/High Transmission
- Multi-layer Thin Film Coating Deposited on Glass Substrates
- Customized sizes available
- Applications: CCD imaging, digital projection, light show, machine vision, and printing

Dichroic filters split light into two components, one transmitted component and one reflected component. A long-pass dichroic filter has a high reflectance below the cut-on wavelength and a high transmittance above it.

Shalom EO offers Longpass Dichroic Filters, utilizing a combination of cutting-edge production techniques and stringent control of qualities, these filters boast a sharp cut-on slope that offers optimum optical selection and exception durabilities. Various dichroic filters with wide operation wavelengths are also available in Hangzhou Shalom EO, our dichroic filters serve as excellent components to separate color in CCD imaging, digital projection, light show, machine vision, and printing. Dichroic shortpass filters can be utilized as hot mirrors and longpass dichroic filters as cold mirrors.

Specifications:

550nm, 638nm, 900nm Longpass Dichroic Filters			
Cut-on Wavelength	550nm	638nm	900nm
Size	customized	customized	customized
Angle of Incidence (AOI)	45°	45°	45°
Transmission Range	Tavg≥90%@565-800nm	Tavg≥88%@655-700nm	Tavg≥90%@932-1200nm
Reflection Range	Ravg≥95%@380nm-533nm	Ravg≥90%@580nm-621nm	Ravg≥90%@400nm-872nm
Surface Quality	40/20 S/D	40/20 S/D	40/20 S/D
Coating Type	Hard coating	Hard coating	Hard coating

Shortpass Dichroic Filters



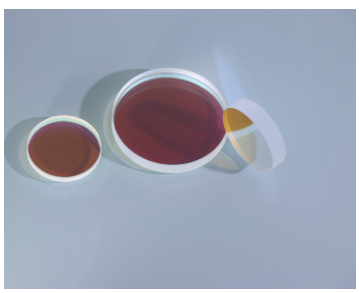
- High Stability and Sharp cut-on slopes
- High Reflection/Low absorption/High Transmission
- Multi-layer Thin Film Coating Deposited on Glass Substrates
- Customized sizes available
- Applications: CCD imaging, digital projection, light show, machine vision, and printing

Dichroic filters split light into two components, one transmitted component and one reflected component. A short-pass dichroic filter has a high transmittance below the cut-off wavelength and a high reflectance above it, allowing a wanted portion of the spectrum to pass and reject (reflect) the rest.
Shalom EO offers Shortpass Dichroic Filters, utilizing a combination of cutting-edge production techniques and stringent control of qualities, these filters boast a sharp cut-on slope that offers optimum optical selection and exception durabilities. Various dichroic filters with wide operation wavelengths are also available in Hangzhou Shalom EO including long pass filters, short pass filters, band pass filters, band blocking filters, and filters for color correction. our dichroic filters serve as excellent components to separate color in CCD imaging, digital projection, light show, machine vision, and printing. Dichroic shortpass filters can be utilized as hot mirrors and longpass dichroic filters as cold mirrors.

Specifications:

650nm, 805nm, 950nm Shortpass Dichroic Filters			
Cut-off Wavelength	650nm	805nm	950nm
Size	customized	customized	customized
Angle of Incidence (AOI)	45°	45°	45°
Transmission Range	Tavg≥88%@400-633nm	Tavg≥88%@400-788nm	Tavg≥88%@420-900nm
Reflection Range	Ravg≥95%@685nm-1200nm	Ravg≥95%@823nm-1200nm	Ravg≥95%@990nm-1200nm
Surface Quality	40/20 S/D	40/20 S/D	40/20 S/D
Coating Type	Hard coating	Hard coating	Hard coating

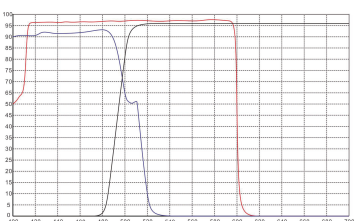
Dichroic Filter for RGB Light Show



- Various options (standard or customized) of RGB Reflection and Transmission available
- High stability and High Transmission
- High Reflection and Low absorption
- Multilayer Thin Film Coating on Glass Substrates
- Customized sizes available

Dichroic Filters reflect a range of wavelengths and transmit others based on the principle of interference, through deliberate engineering of dielectric coatings deposited and substrates, dichroic filters can realize precise selection of light. Because the filters split light into two components: a reflection component and a transmission component, a user can select spectral regions of interest and decide whether the separated light spectrum should be utilized or dumped.

Coating Curves Example:



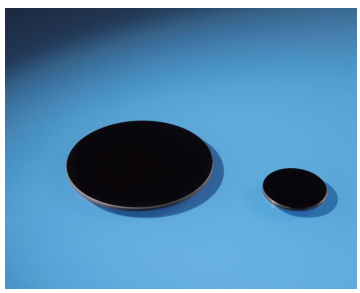
This catalog specifies Shalom EO's Dichroic Filters for RGB Laser Show, these dichroic filters offer combinations of exceptional transmittance and reflectance at red (650nm), green (532nm), blue(473nm) wavelengths. Multitude standard groupings of transmission and reflection of RGB wavelengths are available, while we also provide custom options. Various dichroic filters with wide operation wavelengths are also available in Hangzhou Shalom EO including longpass filters, shortpass filters, bandpass filters, notch filters, and filters for color correction. our dichroic filters serve as excellent components to separate color in CCD imaging, digital projection, light show, machine vision, and printing.

Modules or Types

Below are some available models of Dichroic Filters used for RGB light show applications (designed for AOI=45°)

Index	Reflection and Transmission Range	
1	Red	650nm reflected
	Green	532nm transmitted
2	Blue	473nm reflected
	Green	532nm transmitted
	Red	650nm transmitted
3	Blue	473nm Reflected
	Green	532nm reflected
	Red	650nm transmitted
4	Red	650nm reflected
	Blue	473nm transmitted
	Green	532nm transmitted
5	Green	532nm reflected
	Red	650nm transmitted
6	Green	532nm Reflected
	Red	650nm reflected
	Blue	473nm transmitted

Laser Line Dichroic Filters



- Multilayer Thin Film Coating Deposited on Glass Substrates
- Low absorption/High Transmission/High Reflection
- Mounted or Unmounted
- Simple Installation
- Customized Dichroic Filters available

Laser line dichroic filters consist of multiple layers of dielectric coatings deposited onto a substrate, engineered with meticulous care to create interference effects that enhance transmission or reflection at specific laser wavelengths. A laser line dichroic filter isolates the harmonic frequencies of lasers from their fundamental frequencies or the other way around.

Implementing a vanguard coating technique, Shalom EO's laser line dichroic provide unmatched transmission/reflection performance at designated wavelengths, while the robustness of our filters ensures long life spans under intensive exposure to radiations.

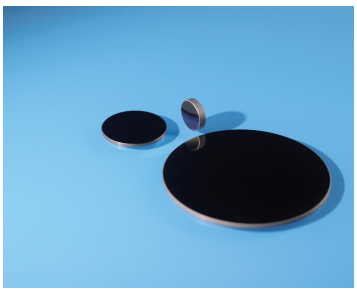
Coating:

HR@1064nm and HT@532nm
HR@532nm and HT@1064nm
HR@355nm and HT@532nm+1064nm
HR@266nm+355nm and HT@532nm+1064nm

Specifications:

Substrate Materials	UV fused silica or BK7	Angle of Incidence (AOI)	45 °
Size Tolerance	+/-0.1mm	Aperture	>90%
Parallelism	<30 arc seconds	Surface Quality	40/20 S/D
Flatness	λ/4 or λ/10@633nm	Coating	S1 with dielectric coating of beam splintering S2: AR coating
Damage Threshold	> 5J/cm2，20ns，20Hz，@1064nm		

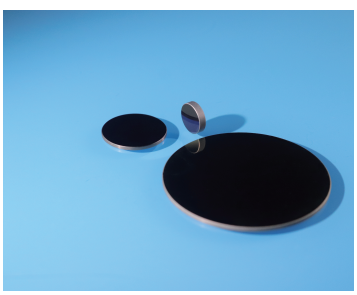
Infrared Filters



Hangzhou Shalom EO offers standard and custom Infrared Filters (IR Filters) in two major subcategories: Broad Bandpass Infrared Filters, Narrow Bandpass Infrared Filters. Our infrared filters are manufactured using various infrared-transmitting substrate materials including silicon, sapphire, IR grade Fused Silica (e.g. Corning 7979/SK-1310), germanium, ZnSe, ZnS, CaF2, etc. Through careful devising utilizing a complexion of the material characteristics of the substrates and coatings and thicknesses, selection and manipulation to a particular IR wavelength range can be realized. Our infrared filters provide versatile functions in manifold applications including Infrared Thermal Imaging, Infrared Thermal Sensing, Infrared Thermography, Infrared light Emitters & Detectors, etc. The filters exhibit exceptional efficiencies when used to isolate emission lines or a broad range of the IR band, maximizing noise to signal ratio. Besides, we also provide Infrared Neutral Density Filters.

The selection wavelengths of Shalom EO's Broad Bandpass Infrared Filters and Narrow Bandpass Infrared Filters cover the entire IR spectrum of 0.9μm - 12μm, providing unmatched selectivities according to your needs, with a high transmission rate that peaks at almost 98%. Infrared applications require high thermal stabilities, with which the high qualities of the substrates and coatings endow our IR filters. All of the specifications of products could be customized upon your request. Feel free to contact us for advice, our experienced and professional engineers are willing to guide you to an optimized solution.

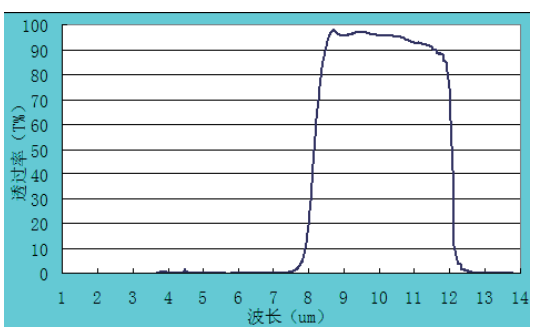
Broadband Infrared Filters



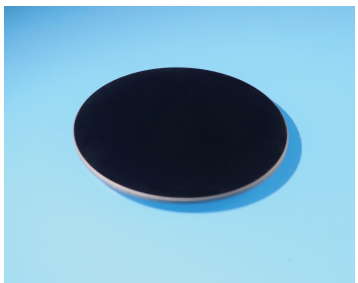
- High transmission rate within the transmission bandwidth
- Wavelength selections covering the whole IR wavelength range of 0.9μm - 12μm
- Various substrate materials including silicon, sapphire, IR-grade fused silica, germanium, etc.
- Applications: IR Thermal Imaging and thermal Sensing, IR Thermography, IR light Emitters and Detectors etc.

Broadband Infrared Filters of Shalom EO, are oriented for transmitting a specific and wide section of the IR spectrum centered around the designed center wavelength. Compared with a narrowband infrared filter, which is also available in Shalom EO, the transmission bandwidth of a broadband infrared filter is broader The substrate materials of Shalom EO's Broadband Infrared Filters are selected from a diverse range including silicon, sapphire, IR grade fused silica (such as Corning7979/SK-1310), germanium, and more, allowing for customized options to suit specific projects, enhancing compatibilities with various environments and applications. Engineered with meticulous caution, our broadband IR filters deliver unparalleled performance across the infrared spectrum. These filters ensure high transmission within their designated bandwidths, enabling reliable and accurate manipulation of infrared signals, and meeting the demands of advanced technological applications.

Transmission of Broadband IR Filters (8-12 Micro):



Narrowband Infrared Filters



- High transmission rate within the transmission bandwidth
- Wavelength selections covering the whole IR wavelength range of 0.9μm - 12μm
- Various substrate materials including silicon, sapphire, IR-grade fused silica, germanium, etc.
- Applications: Gas Detection, Semiconductor, etc.

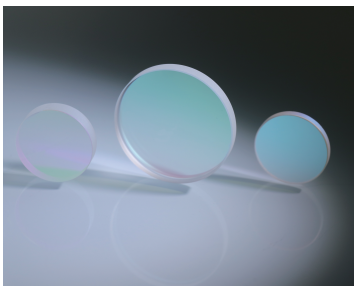
Narrowband Infrared Filters of Shalom EO, are oriented for transmitting a specific and narrow section of the IR spectrum centered around the designed center wavelength while blocking the remaining lights. The substrate materials of Shalom EO's Narrowband Infrared (IR) Filters are selected from a diverse range including Si, sapphire, IR grade fused silica (such as Corning7979/SK-1310), Ge, and more, allowing for customized options to suit specific projects, enhancing compatibilities with various environments and applications. Selectable transmission bandwidths cover the entire IR wavelength spectrum from 0.9μm to 12μm. These filters feature high transmission within their designated bandwidths, enabling reliable and accurate manipulation of infrared signals, and meeting the demands of advanced technological applications like gas detection and semiconductor.

Modules or Types:

Here are some available models of the Narrowband IR Filters optimized for gas detection :

Code	CWL	HPBW	Tpeak(%)	Blocking(Tavg<1%)	Detected Gas
40702-001	2.00±20nm	44±10nm	≧ 80%	400-3200nm	CO2
40702-002	2.18±20nm	41±10nm	≧ 80%	400-3200nm	HF ref
40702-003	2.45±25nm	72±10nm	≧ 75%	400-20000nm	HF means
40702-004	2.89±20nm	54±10nm	≧ 75%	400-20000nm	H2O
40702-005	3.55±30nm	132±20nm	≧ 75%	400-20000nm	HCl
40702-006	4.72±50nm	90±10nm	≧ 75%	400-11000nm	CO
40702-007	5.25±50nm	100±10nm	≧ 75%	400-11000nm	NO
40702-008	5.46±50nm	102±10nm	≧ 75%	400-11000nm	SO2 ref
40702-009	6.25±100nm	124±10nm	≧ 75%	400-11000nm	NO2
40702-010	7.40±100nm	126±10nm	≧ 80%	400-10000nm	SO2
40702-011	10.6±200nm	1172±150nm	≧ 75%	400-12000nm	NH3

Optical Notch Filter



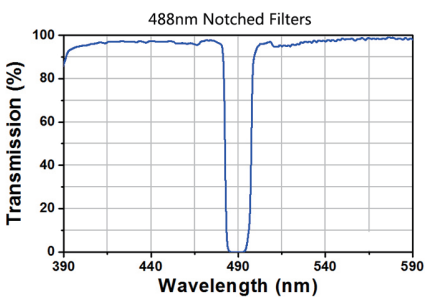
- Designed to reject a specific range of wavelengths while offering high transmission to the remaining wavelengths
- Enabling the Isolation or removal of certain spectrum
- Optical Density: standard: <OD3, OD4; Custom: OD4 or OD6
- Sharp transition slopes, >90% transmission outside the stop band
- Applications: spectroscope, Raman spectroscope, fluorescence microscope, telecommunications, lidar

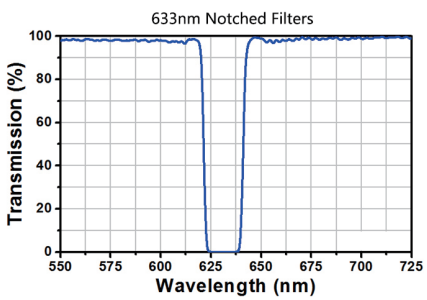
Optical Notch Filters also known as Optical Band Stop Filters or Optical Band Reject Filters are optical components designed to block specific wavelengths of light in selection while allowing others to pass through with little hindrance. Notch filter offers high transmission out of the stop band and large rejection to the wavelengths outside the stop, the result is a sharp attenuation or 'notch' in the filter's transmission spectrum at the desired wavelength, while neighboring wavelengths remain unaffected to a great extent, enabling isolation of spectral regions or suppressing unwanted background noise. In fact, an optical notch filter can be viewed as an inverse of a bandpass filter.

With sharp transition slopes at the rejection and transmission regions, our optical notch filters deliver optimized results in various optical applications where spectral control is paramount. For instance, in spectroscopy, notch filters are used to remove unwanted spectral lines or laser wavelengths, allowing researchers to focus on the target signals of interest. The notch filters we supplied in Shalom EO cater to an extensive spectrum, with their standard or custom center wavelengths covering the common laser line wavelengths of 405nm, 488nm, 514nm, 533nm, 561nm, 594nm, 633nm, 658nm, 785nm, 808nm, 980nm, and 1064 nm, and other UV, VIS, IR wavelengths.

Hangzhou Shalom EO offers Off-the-shelf and Custom Optical Notch Filters. Our optical band stop filters consist of BK7 or UV Fused Silica substrate stacked with dielectric interference coatings, the available optical densities range from <OD3, OD4 to a maximum of OD6 (which is <0.0001% transmission within the stop band), while the out-of-band transmission is >90% or can be customized. All the optical notch filters are mounted in black anodized Aluminum rings for ease of handling, the ring can further increase the optical density by ameliorating scattering.

Transmission of Notched Filters :





Specifications:

Materials	BK7 or UV Fused Silica	Size	Standard or Custom
Optical Density at Rejection Wavelength	<OD3, OD4 or OD6	High Transmission at Transmission Wavelength Range	>90% or Custom
Aperture	>90%	Transmitted Wavefront Distortion	λ/4@633nm or λ/10@ 633nm
Parallelism	<30 arc second	Surface Quality	40/20 S/D or 60/40 S/D

Laser Line Filters



- Ideal for transmitting laser light while suppressing ambient light
- Excellent out-of-band blocking: OD4 (=transmission<0.01%) or custom
- Various laser type applications including GaAlAs, N2, XeF, Nd-YAG, Ar, Kr, InGaAsP etc.
- Standard Central wavelength range 337.1-1550nm, Band width 8nm or 10nm
- Both standard and customized modules available

Laser Line Filters are precision optical filters engineered to exhibit high transmission at the laser's emission wavelength(s) while providing excellent attenuation outside of this range, isolating the laser line from ambient light.

Shalom EO offers Standard and Custom Laser Line Filters. Our laser line filters excel in the narrowness of the bandwidths, out-of-band blocking, high steepness of cut-on and cutoff slopes with a flat passband profile, and excellent transmission within the transmission bandwidth, guaranteeing unparalleled precision in separating the desired laser wavelengths from ambient interruptions. As a convergence of forward dielectric interference coating techniques, extensive wavelength coverage, and good durabilities, our laser line filters cater to a diverse range of applications.

Specifications:

Central Wavelength Tolerance	+/-20% of nominal bandwidth	Bandwidth Tolerance	+/-20% max
Out of Band Blocking	<0.01% (OD4)	Diameter Sizes(mm)	12, 12.7, 15.0, 25.0, 25.4
Clear Apertures(mm)	8.0, 8.0, 10.5, 20.5, 20.5	Temperature Range	-50℃ to 80℃

Modules or Types:

Laser Type	Central Wavelength (nm)	BandWidth (nm)	Peak Trans. (%)
N2	337.1+/-2	10+/-2	>50
XeF	352.0+/-2	10+/-2	>50
Cd	441.6+/-2	8+/-2	>80
Ar	488.0+/-2	8+/-2	>80
Ar	514.5+/-2	8+/-2	>80
Nd-YAG	532.0+/-2	8+/-2	>80
HeNe	632.8+/-2	10+/-2	>80
GaAlAs	635+/-2	10+/-2	>80
Kr	647.1+/-2	10+/-2	>80
GaAlAs	650+/-2	10+/-2	>80
GaAlAs	670+/-2	10+/-2	>80
Ruby	694.3+/-2	10+/-2	>80
GaAlAs	730+/-2	10+/-2	>80
GaAlAs	750+/-2	10+/-2	>80
GaAlAs	780+/-2	10+/-2	>80
GaAlAs	808+/-2	10+/-2	>80
GaAlAs	830+/-2	10+/-2	>80
GaAlAs	850+/-2	10+/-2	>80
GaAlAs	880+/-2	10+/-2	>80
GaAlAs	905+/-2	10+/-2	>80
GaAlAs	940+/-2	10+/-2	>80
GaAlAs	980+/-2	10+/-2	>80
Nd-YAG	1060+/-2	10+/-2	>80
Nd-YAG	1064+/-2	10+/-2	>80
HeNe IR	1152+/-2	10+/-2	>80
InGaAsP	1310+/-2	10+/-2	>80
Nd-YAG	1320+/-2	10+/-2	>80
HeNe IR	1523+/-2	10+/-2	>80
InGaAsP	1550+/-2	10+/-2	>80

Biochemical Optical Filters



Biochemical Optical Filters are sophisticated components used in various scientific and medical applications to selectively transmit or block specific wavelengths of light based on their interaction with biological molecules and compounds. These filters are crucial in the field of real-time PCR, microplate reader, polarimeter, and other optical techniques for analyzing and visualizing biological samples. By exploiting the unique optical properties of biomolecules, such as proteins, nucleic acids, and fluorescent dyes, biochemical optical filters enable researchers to isolate and measure specific signals within complex mixtures, facilitating the precise detection and quantification of biological substances. These filters are a pivotal part of advancing our understanding of cellular processes, medical diagnostics, and numerous biotechnological applications.

Hangzhou Shalom EO offers large selections of standard and custom Biochemical Optical Filters, including Narrowband Filters for Biochemistry Analyzers, Narrowband Filters for Enzyme Labeling Instruments, and Narrowband Filters for Polarimeters.

Narrowband Filters for Biochemistry Analyzers



- Mounted narrowband filters of hard coating
- Substrate materials : Colored glass+BK7
- Excellent optical density: ≥OD4
- Blocking wavelength range: 200-1200nm
- Band width: 10nm+/-1nm

Shalom EO offers stock and custom Narrowband Filters for Biochemistry Analyzers. These filters utilize a cutting-edge hard coating technique, where the hard coatings are deposited on substrates consisting of colored glass bonded with BK7. The standard Optical Density is ≥OD4, which blocks unwanted wavelengths with great rejection effectiveness, ensuring accurate, targeted analysis. Their 10nm+/-1nm Bandwidth enables sharp isolation of specific wavelengths, facilitating impeccable biochemical measurements.

Specifications:

Full Width-Half Max (FWHM)	10.0+/-1nm	Minimum Transmission	>50%
Optical Density (OD)	≧ 4.0	Block Wavelength Range	200 ~1200nm
Surface Quality	80/50 S/D	Substrate Materials	Colored Glass + BK7

Product List of Narrowband Filters for Biochemistry Analyzers

Code	Wavelength	Diameter	Aperture	Bandwidth	Unit Price
411-001	340nm	6mm	4mm	10nm	Inquire
411-002	340nm	8mm	6mm	10nm	Inquire
411-003	340nm	10mm	6mm	10nm	Inquire
411-004	340nm	10mm	7mm	10nm	Inquire
411-005	340nm	12mm	8mm	10nm	Inquire
411-006	340nm	15mm	12mm	10nm	Inquire
411-007	380nm	6mm	4mm	10nm	Inquire
411-008	380nm	8mm	6mm	10nm	Inquire

Product List of Narrowband Filters for Biochemistry Analyzers

Code	Wavelength	Diameter	Aperture	Bandwidth	Unit Price
411-009	380nm	10mm	6mm	10nm	Inquire
411-010	380nm	10mm	7mm	10nm	Inquire
411-011	380nm	12mm	8mm	10nm	Inquire
411-012	380nm	15mm	12mm	10nm	Inquire
411-013	405nm	6mm	4mm	10nm	Inquire
411-014	405nm	8mm	6mm	10nm	Inquire
411-015	405nm	10mm	6mm	10nm	Inquire
411-016	405nm	10mm	7mm	10nm	Inquire
411-017	405nm	12mm	8mm	10nm	Inquire
411-018	405nm	15mm	12mm	10nm	Inquire
411-019	492nm	6mm	4mm	10nm	Inquire
411-020	492nm	8mm	6mm	10nm	Inquire
411-021	492nm	10mm	6mm	10nm	Inquire
411-022	492nm	10mm	7mm	10nm	Inquire
411-023	492nm	12mm	8mm	10nm	Inquire
411-024	492nm	15mm	12mm	10nm	Inquire
411-025	546nm	6mm	4mm	10nm	Inquire
411-026	546nm	8mm	6mm	10nm	Inquire
411-027	546nm	10mm	6mm	10nm	Inquire
411-028	546nm	10mm	7mm	10nm	Inquire
411-029	546nm	12mm	8mm	10nm	Inquire
411-030	546nm	15mm	12mm	10nm	Inquire
411-031	578nm	6mm	4mm	10nm	Inquire
411-032	578nm	8mm	6mm	10nm	Inquire
411-033	578nm	10mm	6mm	10nm	Inquire
411-034	578nm	10mm	7mm	10nm	Inquire
411-035	578nm	12mm	8mm	10nm	Inquire
411-036	578nm	15mm	12mm	10nm	Inquire
411-037	630nm	6mm	4mm	10nm	Inquire
411-038	630nm	8mm	6mm	10nm	Inquire
411-039	630nm	10mm	6mm	10nm	Inquire
411-040	630nm	10mm	7mm	10nm	Inquire
411-041	630nm	12mm	8mm	10nm	Inquire
411-042	630nm	15mm	12mm	10nm	Inquire
411-043	670nm	6mm	4mm	10nm	Inquire
411-044	670nm	8mm	6mm	10nm	Inquire
411-045	670nm	10mm	6mm	10nm	Inquire
411-046	670nm	10mm	7mm	10nm	Inquire
411-047	670nm	12mm	8mm	10nm	Inquire
411-048	670nm	15mm	12mm	10nm	Inquire
411-049	700nm	6mm	4mm	10nm	Inquire
411-050	700nm	8mm	6mm	10nm	Inquire
411-051	700nm	10mm	6mm	10nm	Inquire
411-052	700nm	10mm	7mm	10nm	Inquire
411-053	700nm	12mm	8mm	10nm	Inquire
411-054	700nm	15mm	12mm	10nm	Inquire

Narrowband Filters for Enzyme Labeling Instruments



- Mounted narrowband filters of hard coating
- Substrate materials : Colored glass+BK7
- Optical density: ≥OD4
- Blocking wavelength range: 200-1200nm
- Band Width: 10nm+/-1nm

Shalom EO offers Narrowband Filters for Enzyme Labeling Instruments. Crafted using cutting-edge hard coating techniques, where filters are deposited onto substrates composed of colored glass bonded with BK7, ensuring robustness and durability in demanding laboratory environments. With a standard Optical Density of ≥OD4, these filters effectively block unwanted wavelengths, enabling precise and targeted analysis of enzymatic reactions. One of the critical features of our narrowband filters is their narrow bandwidth, the standard is 10nm+/-1nm. This narrow bandwidth allows for the sharp isolation of specific wavelengths relevant to the enzymatic reaction under investigation. By minimizing spectral overlap and background interference, these filters enhance the signal-to-noise ratio, thus improving the accuracies and reliabilities of enzymatic measurements. In addition to their standard configurations, narrowband filters can be customized to match the spectral characteristics of target analytes.

Common Specifications:

Coating Type	Hard Coating	Full Width-Half Max (FWHM)	10.0+/-1nm
Minimum Transmission	>50%	Optical Density (OD)	≧ 4.0
Block Wavelength Range	200 ~1200nm	Surface Quality	80/50 S/D
Substrate Materials	Colored Glass + BK7		

Product List of Narrowband Filters for Enzyme Labeling Instruments

Code	Wavelength	Diameter	Aperture	Bandwidth	Unit Price
411-013	405nm	6mm	4mm	10nm	Inquire
411-014	405nm	8mm	6mm	10nm	Inquire
411-015	405nm	10mm	6mm	10nm	Inquire
411-016	405nm	10mm	7mm	10nm	Inquire
411-017	405nm	12mm	8mm	10nm	Inquire
411-018	405nm	15mm	12mm	10nm	Inquire
412-007	450nm	6mm	4mm	10nm	Inquire
412-008	450nm	8mm	6mm	10nm	Inquire
412-009	450nm	10mm	6mm	10nm	Inquire
412-010	450nm	10mm	7mm	10nm	Inquire
412-011	450nm	12mm	8mm	10nm	Inquire
412-012	450nm	15mm	12mm	10nm	Inquire
411-019	492nm	6mm	4mm	10nm	Inquire
411-020	492nm	8mm	6mm	10nm	Inquire
411-021	492nm	10mm	6mm	10nm	Inquire
411-022	492nm	10mm	7mm	10nm	Inquire
411-023	492nm	12mm	8mm	10nm	Inquire
411-024	492nm	15mm	12mm	10nm	Inquire
412-019	540nm	6mm	4mm	10nm	Inquire
412-020	540nm	8mm	6mm	10nm	Inquire
412-021	540nm	10mm	6mm	10nm	Inquire
412-022	540nm	10mm	7mm	10nm	Inquire
412-023	540nm	12mm	8mm	10nm	Inquire
412-024	540nm	15mm	12mm	10nm	Inquire
412-025	570nm	6mm	4mm	10nm	Inquire
412-026	570nm	8mm	6mm	10nm	Inquire
412-027	570nm	10mm	6mm	10nm	Inquire
412-028	570nm	10mm	7mm	10nm	Inquire
412-029	570nm	12mm	8mm	10nm	Inquire
412-030	570nm	15mm	12mm	10nm	Inquire
412-031	590nm	6mm	4mm	10nm	Inquire
412-032	590nm	8mm	6mm	10nm	Inquire
412-033	590nm	10mm	6mm	10nm	Inquire
412-034	590nm	10mm	7mm	10nm	Inquire
412-035	590nm	12mm	8mm	10nm	Inquire
412-036	590nm	15mm	12mm	10nm	Inquire
411-037	630nm	6mm	4mm	10nm	Inquire
411-038	630nm	8mm	6mm	10nm	Inquire
411-039	630nm	10mm	6mm	10nm	Inquire
411-040	630nm	10mm	7mm	10nm	Inquire
411-041	630nm	12mm	8mm	10nm	Inquire
411-042	630nm	15mm	12mm	10nm	Inquire

Narrowband Filters for Polarimeter



- Mounted narrowband filters of hard coating
- Substrate materials : Colored glass+BK7
- Optical density: ≥OD4
- Blocking wavelength range: 200-1200nm
- Band Width: 10nm+/-1nm

Polarimeters measure the polarization attributes of both light beams and samples. Narrowband Filters for Polarimeters are optical filters engineered with sophisticated optical techniques transmitting a narrow bandwidth around the center wavelengths. Integration of narrowband filters into polarimeters enhances the instruments' capacity to analyze the polarization properties of light, crucial for diverse applications ranging from material characterization to chemical analysis.

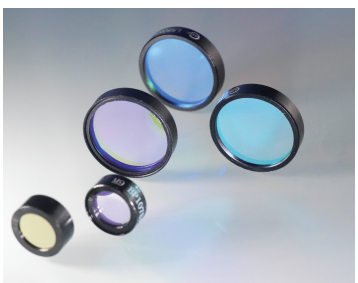
Common Specifications:

Full Width-Half Max (FWHM)	10.0+/-1nm	Minimum Transmission	>80%
Optical Density (OD)	≧ 4.0	Block Wavelength Range	200 ~1200nm
Surface Quality	80/50 S/D	Substrate Materials	Colored Glass + BK7

Product List of Narrowband Filters for Polarimeter

Code	Wavelength	Diameter	Aperture	Bandwidth	Unit Price
413-001	420nm	6mm	4mm	10nm	Inquire
413-002	420nm	8mm	6mm	10nm	Inquire
413-003	420nm	10mm	6mm	10nm	Inquire
413-004	420nm	10mm	7mm	10nm	Inquire
413-005	420nm	12mm	8mm	10nm	Inquire
413-006	420nm	15mm	12mm	10nm	Inquire
411-025	546nm	6mm	4mm	10nm	Inquire
411-026	546nm	8mm	6mm	10nm	Inquire
411-027	546nm	10mm	6mm	10nm	Inquire
411-028	546nm	10mm	7mm	10nm	Inquire
411-029	546nm	12mm	8mm	10nm	Inquire
411-030	546nm	15mm	12mm	10nm	Inquire
413-013	589nm	6mm	4mm	10nm	Inquire
413-014	589nm	8mm	6mm	10nm	Inquire
413-015	589nm	10mm	6mm	10nm	Inquire
413-016	589nm	10mm	7mm	10nm	Inquire
413-017	589nm	12mm	8mm	10nm	Inquire
413-018	589nm	15mm	12mm	10nm	Inquire
413-019	620nm	6mm	4mm	10nm	Inquire
413-020	620nm	8mm	6mm	10nm	Inquire
413-021	620nm	10mm	6mm	10nm	Inquire
413-022	620nm	10mm	7mm	10nm	Inquire
413-023	620nm	12mm	8mm	10nm	Inquire
413-024	620nm	15mm	12mm	10nm	Inquire
413-025	650nm	6mm	4mm	10nm	Inquire
413-026	650nm	8mm	6mm	10nm	Inquire
413-027	650nm	10mm	6mm	10nm	Inquire
413-028	650nm	10mm	7mm	10nm	Inquire
413-029	650nm	12mm	8mm	10nm	Inquire
413-030	650nm	15mm	12mm	10nm	Inquire

Fluorescence Filters



- Exceptional optical density>OD6
- Ideal for Point-of-Care Testing (POCT), Polymerase Chain Reaction (PCR), and fluorescence microscopes
- Available in stock and custom versions
- Standardized dimensions compatible with filter cubes from elite suppliers
- Supporting miscellaneous fluorophores such as FAM EX, Alexa Fluor, ATTO, BCECF, Cy5, Cy3, DAPI, DyLight, GFP, FITC, LysoTracker, mCherry, MitoTracker, Qdot, Quasar, Rhodamine, Texas Red, etc.

Fluorescence Filters are critical components used in biomedical and life science instruments. Their prior function is to separate and select the characteristic spectral bands of excitation and emitted fluorescence of the tested substance in biomedical fluorescence analysis instruments. These filters find widespread applications in fields such as Point-of-Care Testing (POCT), Polymerase Chain Reaction (PCR), fluorescence enzyme labeling instruments, and fluorescence microscopes. Fluorescence filters consist of two to three

parts: excitation filters, emission filters (also known as barrier filers), and, depending on the optical path requirements, dichroic filters might be employed.

During the operation process, the excitation filter is placed within the illumination path of a fluorescence microscope and transmits a narrow band of light around the peak fluorophore excitation wavelength (i.e. the wavelengths that excite a specific dye) toward the specimen. The emission filter (also known as the barrier filter) selects the fluorescence emitted from the sample while removing other unwanted traces of excited light. Barrier filters block (suppress) shorter wavelengths and have high transmission for longer wavelengths. Emission filters can be either bandpass filters or long-pass filters, depending on the specific requirements of the application. A dichroic filter (or beamsplitter) is placed at a 45° angle in the microscope's optical path. It reflects one color of light (excitation light) and transmits another color of light (emission light). In a microscope, the dichroic mirror directs the proper wavelengths to the specimen and to the image plane. Ideal dichroic filters and beamsplitters have sharp transitions between maximum reflection and maximum transmission, with a >95% reflection for the bandwidth of the excitation filter and a transmission of >90% for the bandwidth of the emission filter.

Shalom EO offers a large selection of fluorescence filters, the fluorescence filters are crafted with standardized dimensions compatible with filter cubes produced by elite suppliers for convenient installation. Our fluorescence filters can support miscellaneous common fluorophores such as FAM EX, Alexa Fluor, ATTO, BCECF, Cy5, Cy3, DAPI, DyLight, GFP, FITC, LysoTracker, mCherry, MitoTracker, Qdot, Quasar, Rhodamine, Texas Red, etc. Shalom EO's fluorescence filters consist of dielectric coatings deposited on glass substrates, through the meticulous engineering of varied refractive indices and reflection characteristics of the filter, high transmission within the transmission band and exceptional optical densities greater than OD6 are obtained, providing effective spectral selection strength. These filters are designed to pass or reject wavelengths of light with great selection performance. High-precision polishing and processing are implemented in our state-of-the-art production line to ensure optimized spectral separation.

Specifications:

Excitation Filter:

Substrate Materials	Custom	Transmission Central Wavelength Range	Can be tailored upon request
Diameters	6-25.4mm	Mount	Mounted
Coating	Hard coating		

Emission Filter:

Substrate Materials	Custom	Transmission Central Wavelength Range	Can be tailored upon request
Diameters	6-25.4mm	Mount	Mounted
Coating	Hard coating		

Dichroic Filter:

Substrate Materials	Custom	Reflection Band	Can be tailored upon request
Diameters	Can be tailored upon request	Transmission Band	Can be tailored upon request
Coating	AR coating		

The following table shows the suggested fluorescence filter combinations used for some common fluorescent fluorophores, if you have requirements or need more detail please contact us:

fluorescent dye	Excitation wavelength	Emission wavelength	Excitation filter		Emission filter		Dichroic Filter	
	Peak value(nm)	Peak value(nm)	CWL(nm)	FWHM(nm)	CWL(nm)	FWHM(nm)	High reflective range (nm)	High Transmission Range (nm)
Alexa Fluor® 350	342	442	350	50	460	50	330-380	430-700
Alexa Fluor® 488	499	520	480	40	535	50	400-500	520-700
Alexa Fluor® 594	590	618	580	25	625	30	500-590	610-700

fluorescent dye	Excitation wavelength	Emission wavelength	Excitation filter		Emission filter		Dichroic Filter	
	Peak value(nm)	Peak value(nm)	CWL(nm)	FWHM(nm)	CWL(nm)	FWHM(nm)	High reflective range (nm)	High Transmission Range (nm)
Alexa Fluor® 633	631	647	605	50	670	50	550-620	645-750
Alexa Fluor® 750	751	776	710	75	810	90	600-730	770-900
AmCyan	458	489	435	20	480	40	425-445	460-600
APC (Allophycocyanin)	650	660	620	60	700	75	600-650	665-730
AsRed 2	576	592	545	30	620	60	530-560	580-700
ATTO 390	392	477	395	25	460	50	350-410	430-550
ATTO 465	453	507	470	40	525	50	400-480	500-600
ATTO 633	629	658	605	50	670	50	550-620	640-750
ATTO 680	680	700	650	45	720	60	600-670	690-800
BCECF (pH 5.2)	482	520	480	40	540	40	350-500	520-650
Biosearch Blue	352	447	350	50	460	50	330-390	430-550
BODIPY FL/pH7.2	505	512	480	40	535	50	400-500	520-600
Brilliant Violet™ 480	437	478	435	20	480	30	425-445	460-600
CAL Fluor® Gold 540	522	544	530	30	575	40	450-540	555-650
CAL Fluor® Red 635	618	637	605	50	670	50	550-620	645-750
Calcein	494	517	480	40	535	50	400-500	515-600
Calcium Green™-1	507	529	480	40	535	50	400-500	515-600
Cerulean	434	473	435	20	480	40	425-445	460-600
CFP	433	475	435	20	480	40	425-445	460-600
Citrine	514	529	500	20	535	30	480-505	520-650
Coumarin	360	448	350	50	460	50	330-390	430-550
Cy2™	492	507	480	40	535	50	400-500	515-600
Cy5™	649	666	620	60	700	75	590-650	665-735
Cy7™	757	781	710	75	810	90	600-730	770-900
DAPI	359	461	350	50	460	50	330-390	430-550
Di-8-ANEPPS non-ratiometric	466	630	480	30	620	60	400-495	515-700
DiA	457	586	480	30	620	60	400-495	515-700

fluorescent dye	Excitation wavelength	Emission wavelength	Excitation filter		Emission filter		Dichroic Filter	
	Peak value(nm)	Peak value(nm)	CWL(nm)	FWHM(nm)	CWL(nm)	FWHM(nm)	High reflective range (nm)	High Transmission Range (nm)
DiD	648	670	620	60	700	75	590-650	665-735
DiI	551	569	545	25	605	70	450-550	570-700
Draq5	647	683	620	60	700	75	590-650	665-735
DsRed	559	583	545	25	605	70	450-550	570-700
DyLight 405	398	420	405	20	460	50	350-410	430-550
DyLight 750	751	778	710	75	810	90	600-730	770-900
DyLight 800	770	795	740	40	800	40	650-750	780-900
ECFP	434	477	435	20	480	40	425-445	460-600
EGFP	488	507	470	40	525	50	400-480	500-600
Emerald GFP	489	510	470	40	525	50	400-480	500-600
Eosin	525	546	500	40	560	50	450-510	530-650
Ethidium bromide	518	603	545	30	620	60	530-560	580-700
FAM	492	518	480	40	535	50	400-500	515-600
FITC	495	519	480	40	535	50	400-500	515-600
FlAsH-CCPFCC	511	530	500	20	535	30	480-505	520-650
Fluo-3	506	527	500	20	535	30	480-505	520-650
Fluo-4	494	516	480	40	535	50	400-500	515-600
FM™ 1-43	473	579	470	30	580	60	400-495	515-700
FM™ 4-64	508	730	510	40	730	100	450-590	605-800
Fura-2/Ca2+ - free	366	515	365	50	510	80	330-390	430-700
FusionRed	577	604	560	40	630	75	500-570	595-750
GFP	489	511	470	40	525	50	400-480	500-600
HEX,SE	533	559	530	30	575	40	450-540	555-700
Hoechst 33258	352	455	350	50	460	50	330-390	430-700
Indo-1/Ca2+ -free	346	480	350	50	460	50	330-390	430-700
JOE	520	548	500	40	560	50	450-510	530-650
Killer Red	585	611	560	40	630	75	500-570	595-750

fluorescent dye	Excitation wavelength	Emission wavelength	Excitation filter		Emission filter		Dichroic Filter	
	Peak value(nm)	Peak value(nm)	CWL(nm)	FWHM(nm)	CWL(nm)	FWHM(nm)	High reflective range (nm)	High Transmission Range (nm)
Li-Cor IRDye® 680LT	674	693	650	45	720	60	600-660	690-800
Li-Cor IRDye® 800CW	778	794	740	40	800	40	650-750	780-900
Lucifer yellow	428	544	420	40	535	40	390-445	460-600
LysoTracker Blue	373	422	395	25	460	50	350-410	430-550
LysoTracker Green	501	509	470	40	525	50	400-480	500-600
LysoTracker Red	573	592	560	40	630	75	500-570	595-750
mCherry	587	610	560	40	630	75	500-570	595-750
mCitrine	514	529	500	20	535	30	480-505	520-650
MitoTracker™ Red	578	598	560	40	630	75	500-570	595-750
mKate2	588	633	560	40	630	75	500-570	595-750
mKO	549	559	530	30	575	40	450-540	555-700
mWasabi	493	509	470	40	525	50	400-480	500-600
NBD-X (MeOH)	467	538	480	40	535	50	400-500	515-700
Nile blue	631	660	620	60	700	75	590-650	665-735
NirFP	604	669	600	40	670	40	580-620	650-800
Oregon Green™ 488	498	526	480	40	535	50	400-500	515-700
Propidium Iodide (PI)	305	617	545	30	620	60	530-560	580-700
Pulsar™ 650	460	650	440	40	630	75	400-480	500-600
Qdot® 525 Nanocrystals	300	525	425	50	525	30	370-470	490-700
Qdot® 625 Nanocrystals	300	621	425	50	625	30	370-470	490-700
Qdot® 655 Nanocrystals	300	654	425	50	655	30	370-470	490-700
Qdot® 705 Nanocrystals	300	702	425	50	705	30	370-470	490-700
Qdot® 800 Nanocrystals	300	792	425	50	800	40	370-470	490-700
Quasar® 570	548	566	530	30	575	40	450-540	555-700
Quasar® 670	647	670	620	60	700	75	590-650	665-735
Quasar® 705	690	750	650	45	720	60	600-660	690-800
ReAsH-CCPGCC	592	606	560	40	630	75	500-570	595-750

fluorescent dye	Excitation wavelength	Emission wavelength	Excitation filter		Emission filter		Dichroic Filter	
	Peak value(nm)	Peak value(nm)	CWL(nm)	FWHM(nm)	CWL(nm)	FWHM(nm)	High reflective range (nm)	High Transmission Range (nm)
Resorufin	571	584	545	20	590	30	450-550	570-700
Rhod-2	553	577	545	25	605	70	450-550	570-700
Rhodamine 123	507	529	500	20	535	30	480-505	520-650
Rhodamine 6G	525	547	500	40	560	50	450-510	530-700
Rhodamine Red-X	573	591	560	40	630	75	500-570	595-750
ROX	578	604	560	40	630	75	500-570	595-750
R-phycoerythrin	565	578	545	10	585	40	500-550	570-800
SBFI/Na+ -saturated	337	527	350	40	560	100	330-390	430-700
Sulforhodamine 101-EtOH	578	593	560	40	630	75	500-570	595-750
SYBR® Green I	498	522	480	40	535	50	400-500	515-700
SYTO 60	650	681	620	60	700	75	590-650	665-735
SYTO 9	483	500	470	40	525	50	400-480	500-600
TagBFP	402	457	405	20	460	50	350-410	430-550
TagRFP	556	584	545	25	605	70	450-550	570-700
TAMRA	555	580	545	25	605	70	450-550	570-700
tdTomato	554	581	545	25	605	70	450-550	570-700
TET	521	542	500	40	560	50	450-510	530-700
Tetracycline	405	550	405	40	550	60	350-460	480-650
Tetramethylrhodamine dextran	554	582	545	25	605	70	450-550	570-700
Texas Red®	592	614	560	40	630	75	500-570	595-750
TO-PRO™-3	642	657	620	60	700	75	590-650	665-735
TRITC	552	578	545	25	605	70	450-550	570-700
TurboFP650	592	650	560	40	630	75	500-570	595-750
wtGFP	474	509	450	50	525	50	370-470	490-700
X-Rhod-1 Indicator	580	601	560	40	630	75	500-570	595-750
ZsGreen1	493	505	470	40	525	50	400-480	500-600
ZsYellow1	529	539	500	40	560	50	450-510	530-700

Machine Vision Filters



Machine Vision means letting a machine become capable of measuring or recognizing the image it takes, just like human eyes can see objects and distinguish them. Machine Vision Filters encompass a diverse range of optical filters designed to modulate the characteristics of light entering a machine vision system. These filters operate by transmitting or blocking specific wavelengths of light through absorption or interference, shaping the spectral composition of the captured images. Machine Vision Filters functions to increase contrast in imaging, and control the brightness of the image, correct color rendition, block unwanted illumination and glare, or bring down the brightness of the image. By strategically filtering out unwanted wavelengths and enhancing the contrast of features of interest, machine vision filters enable more accurate and reliable analysis of visual data.

Hangzhou Shalom EO launched the research of machine vision filters in 2006 and gained prosperous results. We have developed 850nm, and 940nm ultra-thin narrowband pass filters for human face identification, 780nm narrowband pass filters for sweeping robots, and 905nm and 1550nm narrowband pass filters for unmanned vehicles. We offer standard and custom machine vision filters for integration into a range of applications. Regarding the standard filters, we offer a substantial stock of Bandpass Filters. Regarding the custom filters, we provide various filter types, including Bandpass Filters, Shortpass Filters, Longpass Filters, Neutral Density Filters, and Color filters. The Shortpass Machine Vision Filters and Longpass Machine Vision Filters feature sharp spectral cut-on and cut-off, providing excellent imaging contrast for color imaging to achieve natural color rendering, the short pass filters, in particular, are exceptional for blocking infrared saturation, while Longpass Optical Filters feature an extensive selectable range of operation wavelengths. Neutral Density (ND) Filters can be stacked to increase optical density, decreasing overall light throughput. Colored glass Filters are ideal for use with monochrome cameras to increase contrast and resolution. The machine vision filters are available in mounted versions for ease of integration into imaging lenses.

Machine Vision Filters (Standard)



- Standardized sizes Φ12.7mm/Φ25.4mm for convenient integration
- High Peak Transmission Rate >90%
- A wide selection of transmission and rejection wavelengths range from UV to IR
- Various bandwidth options from 6nm to 80nm

Machine Vision Filters are a critical part of the image acquisition section, designed to improve image quality by manipulating the spectral characteristics of the light entering the image vision system, making the observation of the objects clearer. A machine vision filter can be used to enhance image contrast, adjust color rendition, block unwanted illumination and glare, or bring down the brightness of image without changing the exposure time or adjusting the f/#.

Hangzhou Shalom initiated research on machine vision filters in 2006, succeeding in the development of various specialized filters, such as ultra-thin narrowband pass filters at 850nm and 940nm for human face identification, 780nm filters for sweeping robots, and 905nm and 1550nm filters for unmanned vehicles. These filters are available in standard and custom options for diverse applications. We offer a full portfolio of machine vision filters. This page features our standard machine vision filters, where a large stock of bandpass filters are available. We also provide custom machine vision filters such as shortpass filters, longpass filters, ND filters, color filters, etc.

Product List of Machine Vision Filters

Code	Types	Central Wavelength	Diameter	Transmission Rate	Blocking Range	Optical Density	Bandwidth	Unit Price
41102-001	Bandpass Filter	470±5nm	12.7mm	>90%	200-1100nm	OD4	25±5nm	Inquire
41102-002	Bandpass Filter	470±5nm	25.4mm	>90%	200-1100nm	OD4	25±5nm	Inquire
41102-003	Bandpass Filter	520±5nm	12.,7mm	>90%	400-1100	OD4	30±5nm	Inquire
41102-004	Bandpass Filters	520±5nm	25.4mm	>90%	400-1100	OD4	30±5nm	Inquire
41102-005	Bandpass Filter	650±5nm	12.7mm	>90%	200-1100nm	OD4	30±5nm	Inquire

Product List of Machine Vision Filters

Code	Types	Central Wavelength	Diameter	Transmission Rate	Blocking Range	Optical Density	Bandwidth	Unit Price
41102-006	Bandpass Filter	650±5nm	25.4mm	>90%	200-1100nm	OD4	30±5nm	Inquire
41102-007	Bandpass Filter	780±3nm	12.7mm	>90%	200-1100nm	OD4	20±3nm	Inquire
41102-008	Bandpass Filter	780±3nm	25.4mm	>90%	200-1100nm	OD4	20±3nm	Inquire
41102-009	Bandpass Filter	813±5nm	12.7mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-010	Bandpass Filter	813±5nm	25.4mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-011	Bandpass Filter	830±3nm	12.7mm	>90%	400-1100nm	OD4	15±3nm	Inquire
41102-012	Bandpass Filter	830±3nm	25.4mm	>90%	400-1100nm	OD4	15±3nm	Inquire
41102-013	Bandpass Filter	850±3nm	12.7mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-014	Bandpass Filter	850±3nm	25.4mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-015	Bandpass Filter	850±5nm	12.7mm	>90%	400-1100nm	OD4	50±5nm	Inquire
41102-016	Bandpass Filter	850±5nm	25.4mm	>90%	400-1100nm	OD4	50±5nm	Inquire
41102-017	Bandpass Filter	905±3nm	12.7mm	>90%	400-1100nm	OD4	20±3nm	Inquire
41102-018	Bandpass Filter	905±3nm	25.4mm	>90%	400-1100nm	OD4	20±3nm	Inquire
41102-019	Bandpass Filter	905±5nm	12.7mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-020	Bandpass Filter	905±5nm	25.4mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-021	Bandpass Filter	922±3nm	12.7mm	>90%	400-1100nm	OD4	60±6nm	Inquire
41102-022	Bandpass Filter	922±3nm	25.4mm	>90%	400-1100nm	OD4	60±6nm	Inquire
41102-023	Bandpass Filter	940±5nm	12.7mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-024	Bandpass Filter	940±5nm	25.4mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-025	Bandpass Filter	950±8nm	12.7mm	>90%	400-1100nm	OD4	50±8nm	Inquire
41102-026	Bandpass Filter	950±8nm	25.4mm	>90%	400-1100nm	OD4	50±8nm	Inquire
41102-027	Bandpass Filter	950±8nm	12.7mm	>90%	400-1100nm	OD4	80±8nm	Inquire
41102-028	Bandpass Filter	950±8nm	25.4mm	>90%	400-1100nm	OD4	80±8nm	nquire
41102-029	Bandpass Filter	980±5nm	12.7mm	>90%	400-1100nm	OD4	30±5nm	Inquire
41102-030	Bandpass Filter	980±5nm	25.4mm	>90%	400-1100nm	OD4	30±5nm	Inqurie
41102-031	Bandpass Filter	1546±1nm	12.7mm	>90%	200-2200nm	OD4	6±1nm	Inquire
41102-032	Bandpass Filter	1546±1nm	25.4mm	>90%	200-2200nm	OD4	6±1nm	Inquire
41102-033	Bandpass Filter	1550±2nm	12.7mm	>90%	300-2500nm	OD4	10±2nm	Inquire
41102-034	Bandpass Filter	1550±2nm	25.4mm	>90%	400-1100nm	OD4	15±3nm	Inquire
41102-035	Bandpass Filter	1655±3	12.7mm	>90%	200-2500nm	OD4	15±3nm	Inquire
41102-036	Bandpass Filter	1655±3nm	25.4mm	⊠90%	200-2500nm	OD4	15±3nm	Inquire
41102-037	Bandpass Filter	1697±3nm	12.7mm	⊠90%	200-2500nm	OD4	15±3nm	Inquire
41102-038	Bandpass Filter	1697±3nm	25.4mm	⊠90%	200-2500nm	OD4	15±3nm	Inquire

Linear Variable Bandpass Filters

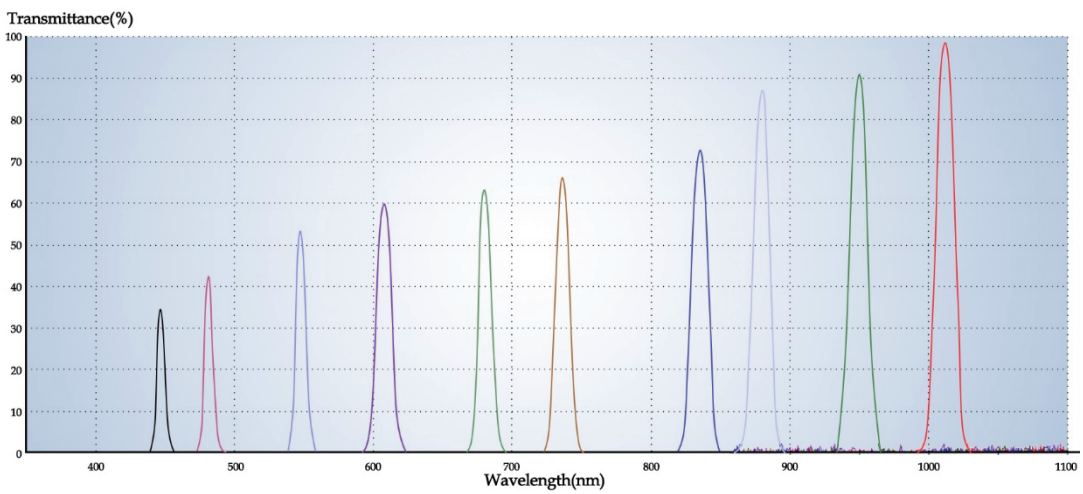


- Variable central wavelengths across the longer dimension: Standard tunable central wavelength range of 450-1000nm
- Unprecedented flexible control over the transmission spectra
- High transmission within a wide selection of transmission bandwidths of 50-400nm
- Effective rejection of unwanted light
- Simple integration into portable and space-constrained optical setups and minimized Weight
- Customizable Size: Standard ranging from 30-40mm or customized dimensions

Linear Variable Bandpass Filter or continuously variable bandpass filters are precision coated wedge-shaped bandpass optical filters with central wavelengths changing in a linear relationship corresponding to the length of the filter, transmitting a specific range of light around the center wavelength while blocking the unwanted spectrum. This spatial variation in optical properties allows for tunable transmission characteristics via position shifting along the longer dimension of the filter. A single linear variable bandpass filter can fulfill the function of multiple homogeneous filters or a grating based monochromator. Linear variable bandpass filter offers a feasible measure to adjust the center wavelength by sliding the filter relative to the light source. Linear variable bandpass filters find widespread use in spectroscope, hyperspectral imaging, and fluorescence microscope applications, where they play a crucial role in isolating specific spectral bands for analysis.

Shalom EO offers standard and custom Linear Variable Bandpass Filters. Utilizing an advanced wedge-shaped multi-layer coating technique, these filters offer high spectral resolution and low optical loss over a broad tunable spectral range. As shown in the transmission curves, our linear variable bandpass filters offer sharp spectral cut-on and cutoff ensuring efficient rejection of undesirable light and high transmission within the passband to maximize optical performance at the required wavelength. Compact, lightweight construction renders them suitable for integration into portable and space-constrained optical setups. Through manipulation of the slope of the thin-film layers, a specific linear variation in transmission wavelength can be achieved, enabling precise spectral control and tuning for various applications. With their wide operating range, high transmission efficiencies, and robust microstructure, these linear variable filters provide reliable performance in demanding laboratory and industrial environments. Besides, we also provide linear variable edge filters and linear variable neutral density filters (circular and rectangular).

Transmission Curves:



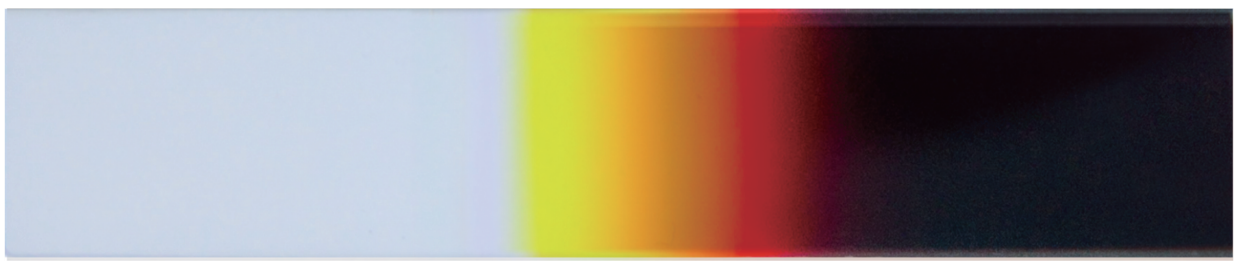
Specification:

Central Wavelength	450-1000nm	Peak Transmission Rate	≥60%
FWHM	50-400nm	Optical Density	≥OD3
Blocking range	300-1100nm	Linear Gradient Rate	60nm/mm
Size	30-40mm	Material	Optical grade Glass
Surface Quality	(or customized)80/50 S/D	Optical grade Glass	

Modules and Types:

Wavelength Range(nm)	Peak Transmission Rate(%)	Optical Density	Bandwidth	Linear Gradient Rate (nm/mm)
400-1000	≥60	OD3	1%@CWL	60

Linear Variable Edge Filters



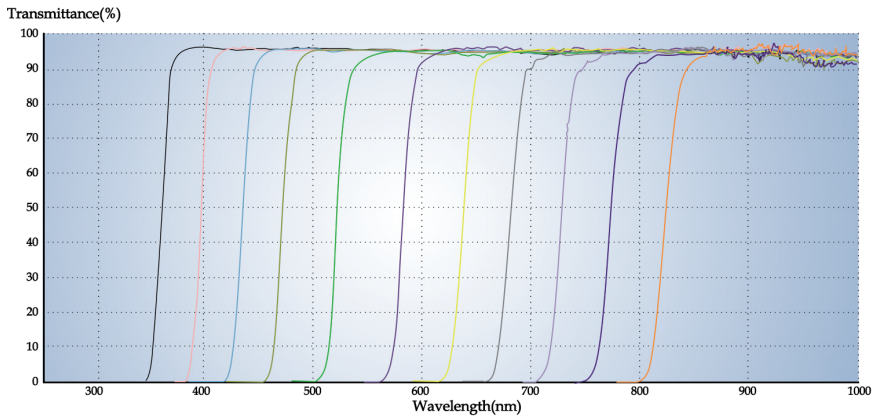
- Adjustable cut-on/cut-off Wavelengths via position change along the length of the filter
- Wide blocking range extending from 410nm to 1100nm
- High optical density, minimizing spectral leakage
- Sharp cut-on and cutoff slopes, high transmission within the pass band
- Available in sizes ranging from 30mm to 60mm, or custom sizes

Linear Variable Edge Filters or continuously variable edge filters are a special kind of optical edge filters with their edge wavelengths shifting across the length of the filter. There is a linear relationship between the changing edge wavelengths and the position along the filter. Linear variable Edge Filters contain two subcategories, linear variable longpass filters and linear variable shortpass filters. Linear variable longpass filters transmit light beyond the specific cut-on wavelengths while rejecting the unwanted light, linear variable shortpass filters transmit light below the designated cut-off wavelengths while blocking the remaining. Unlike traditional longpass and short filters that offer fixed cut-on/cutoff wavelengths, linear variable longpass, and shortpass filters provide the flexibility to adjust the cut-on or cutoff wavelength, allowing for precise control over the spectral characteristics of the transmitted light. Linear Variable Edge Filters find versatile utilities in various applications such as spectroscopy, fluorescence microscopy, hyperspectral imaging, and optical instrumentation.

Hangzhou Shalom EO offers Standard and Custom Longpass and Shortpass Linear Variable Edge Filters. These filters utilize a combination of microfabrication techniques and thin film deposition technologies, allowing for the production of high-performance linear variable edge filters with precise control over their optical properties. As can be witnessed from the transmission curves, these linear variable edge filters boast steep spectral cut-on/cut-off, excellent transmittance within the passband, and high optical density ensuring excellent out-of-band light suppression and minimal spectral leakage. Our filters are in particular useful in situations where precise and tunable manipulation over the transmitted wavelength range is required, such as in spectral analysis, where the filters can be used to isolate specific spectral lines or bands of interest. These linear variable filters provide reliable performance in demanding laboratory and industrial environments.

Through combined usage of one of our linear variable longpass filters with a corresponding linear variable shortpass filters, a tunable Bandpass Filter can be obtained where both center wavelength and bandwidth are tunable. Besides, we also provide linear variable bandpass filters and linear variable neutral density filters (circular and rectangular).

Transmission Curves :



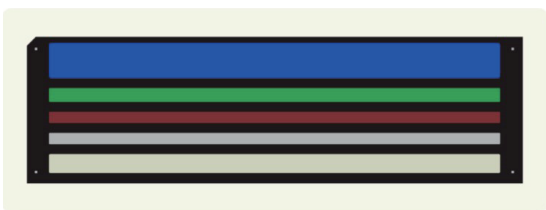
Specification:

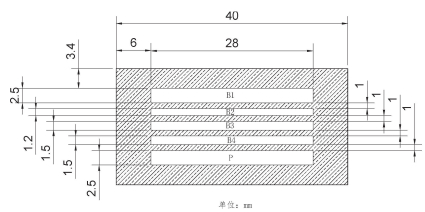
Cut-on/Cut-off wavelength	400-800nm	Blocking Range	410-1100nm
Peak Transmission Rate	≥85% (or customized)	Optical Density	≥OD3
Linear Gradient Rate	Customizable	Size	30-60mm(or customized)
Material	Optical grade Glass	Surface Quality	60/40 S/D

Modules and Types:

Wavelength Range(nm)	Peak Transmission Rate (%)	Optical Density	Bandpass Type	Linear Gradient Rate(nm/mm)
400-800	≥85	≥OD3	Shortpass	7
400-800	≥85	≥OD3	Longpass	7
300-860	≥85	≥OD3	Longpass	22.3

Photolithographic Multispectral Filters



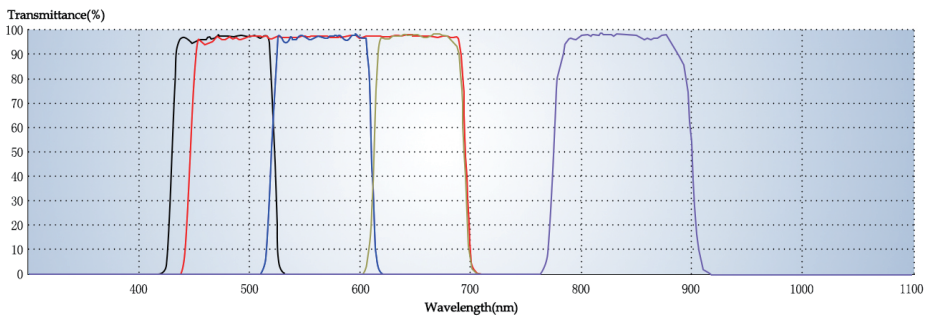


- Multi-wavelength selectivity, enabling the separation and collection of multispectral components.
- High-precision photolithographic manufacturing technique, high performance and stability
- Wide wavelength range, covering visible, infrared, and ultraviolet spectra
- Available in standard and custom versions
- Applications: remote sensing image processing, medical imaging, biomedical research, and industrial inspection

Photolithographic multispectral filters are precision-produced using a combination of coating technique and photolithography, which is a delicate technique to produce thin-film patterns, where an optical mask is irradiated with UV light to transfer the existing geometric pattern over the optical mask to a substrate via a light-sensitive chemical process. In the initial processing procedure of the photolithographic multispectral filters, a channel-specific photomask is coated and structured using the photolithographic method. This first coating forms the apertures for the following filter coatings, where high-performance thin-film coatings are coated in sequence within the patterned apertures. Multiple thin film coatings offering high transmission to an exclusive spectrum are assembled on one monolithic substrate. This design provides overwhelming convenience in multi-spectral imaging acquisition, allowing a more compact design. Depending on the need, multispectral filters can be used in various applications, such as remote sensing image processing, medical imaging, biomedical research, environmental monitoring, and industrial inspection. In these applications, multispectral filters can help to achieve more detailed and accurate analyses of target objects or scenes.

Shalom EO offers standard and custom photolithographic multispectral filters. Regarding the standard photolithographic multispectral filters, 4-channel filters and 5-channel filters are available. Using advanced thin-film coating and photolithographic techniques, the filter separates light into discrete spectral bands with sharp spectral cut-on/cut-off and exceptional transmittance within the transmission bands. Thin film coatings are deposited on optical grade sapphire substrates with an unparalleled hardness to withstand the rigors of challenging operations. A premium precision standard of 10/5 S/D and ±5μm graphic dimensional tolerance are attained accredited to an accurate geometric regulation. Our multispectral filters provide excellent results when combined with an imaging sensor such as a CCD, CMOS, SWIR, MIDIR, and LWIR to select a specific spectral range to be imaged on several pixels.

Transmission Curves:



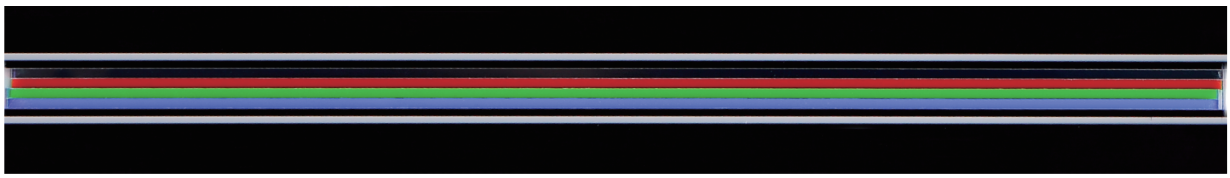
Specification:

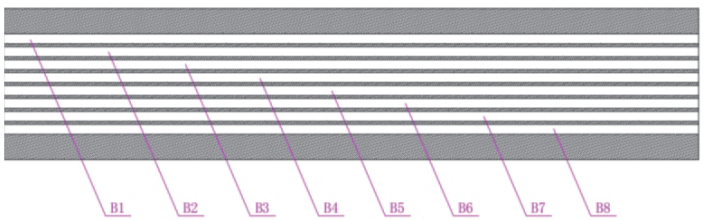
Central Wavelength	450-850nm	Peak Transmission Rate	≥92%(or customized)
FWHM	50-400nm	Optical Density	≥OD3
Blocking Range	300-1100nm	Black Masking Area	r≤3%
Size	20-81mm(or customized)	Material	Optical Grade Sapphire
Surface Quality	10/5 S/D	Graphic Dimension Tolerance	±5μm

Modules and Types:

Central Wavelength (nm)	FWHM (nm)	Gradient (nm)	Optical Density (nm)	Average Transmission Rate(%)
475±10	90±20	15	OD≥3 @300-1100nm	T≥92
560±10	80±20	15		
625±10	350±20	20		
660±10	60±20	15		
830±10	120±20	15		

Spliced Multispectral Filters



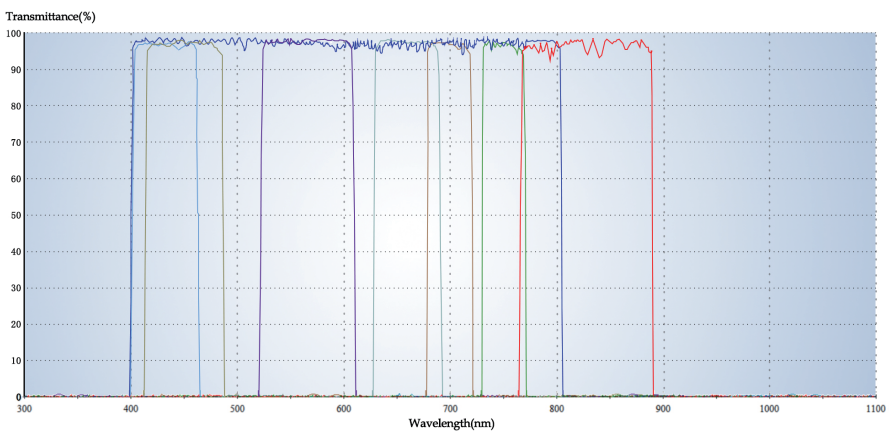


- Integration of multiple spectral channels into one single filter, allowing simultaneous filtering of discrete spectra
- Customizable size and peak transmission Rates
- Higher Transmission Efficiency, Lower Optical Aberrations
- Precision Cutting and Splicing Techniques

A spliced Multispectral Filter is a special kind of optical filter that combines multiple single-spectral filters into one integrated multispectral filter using cutting and splicing techniques. These filters serve a crucial function in various optical systems. Combining different spectral filters into a single unit enables precise and simultaneous spectral filtering across a wide range of wavelengths, The filters provide enhanced convenience for the acquisition of multispectral data with high spatial and spectral resolution, pushing the boundaries of advanced spectral imaging capabilities across various scientific, industrial, and medical fields in applications like remote sensing, medical imaging, biomedical research, and industrial inspection. Moreover, a single multiple spectral filter can substitute several single-spiral filters, allowing a more compact and simple construction of the system.

Shalom EO offers standard and custom multispectral filters. Standard 8-channel versions are available. One technical ordeal for manufacturing spliced multispectral filters is the parallelism of the channel stripes, which Shalom EO has succeeded in conquering by utilizing precision-regulated cutting and splicing techniques to integrate multiple spectral channels. Throughout this process, we control with meticulous caution the parallelism of different channels to prevent light leakage at splice joints and ensure the strength and reliability of the splicing process. In addition, by securing the precise alignment of constituent filters, our spliced multispectral filter results in a signal-to-noise ratio, elevating your research, innovation, and applications to new heights. Compared with single multispectral filters, these spliced filters provide improved spectral isolation, higher transmission efficiencies, and reduced optical aberrations, resulting in better overall performance and image quality. Our multispectral filters are remarkable when combined with an imaging sensor such as a CCD, CMOS, SWIR, MIDIR, and LWIR to select a specific spectral range to be imaged on several pixels.

Transmission Curves :



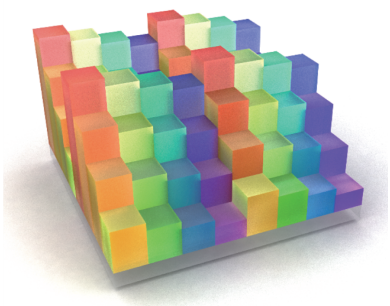
Specification:

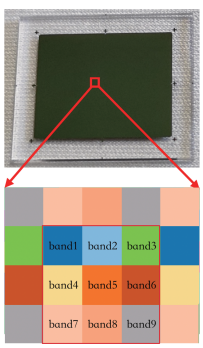
Central Wavelength	450-850nm	Peak Transmission Rate	≥92%(or customized)
FWHM	20-400nm	Optical Density	≥OD3
Blocking Range	300-1100nm	Splice Position Accuracy	300-500μm
Size	20-100mm(or customized)	Material	Optical Grade Glass

Modules and Types:

Central Wavelength(nm)	FWHM (nm)	Gradient (nm)	Optical Density (nm)	Average Transmission Rate(%)
430±10	60±20	15	OD≥3 @300-1100	T≥95%
450±10	70±20	15		
560±10	80±20	15		
610±10	40±20	15		
660±10	60±20	15		
700±10	40±20	15		
750±10	40±20	20		
830±10	120±20	25		

Pixel Level Mosaic Filters



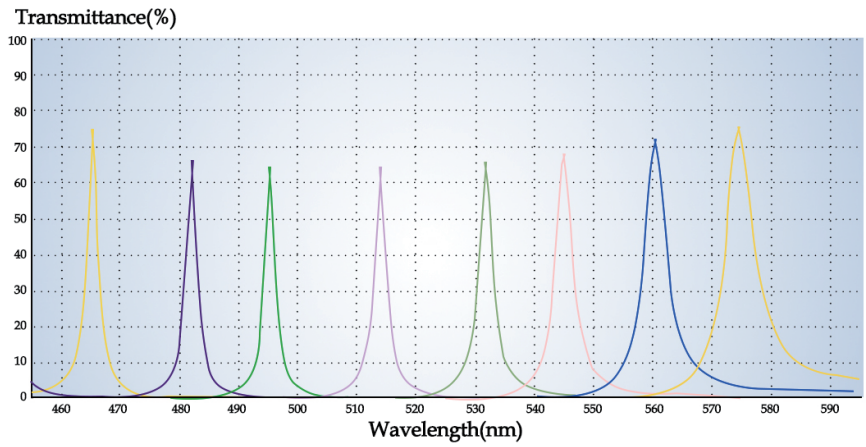


- Intensive integration of spectral and photometric functions
- Sizes can be tailored according to the sizes of the pixel size of the detectors
- Efficient spectral imaging, capable of working in video imaging mode
- Allowing miniaturization and lightweight design
- Wide Application: camouflage identification, precision agriculture, and medical monitoring

Pixel Level Mosaic Filters or Mosaic filters are a kind of sophisticated multispectral filters with intensive integration of spectral and photometric functions. Pixel level mosaic filter is fabricated by organizing multiple micrometer-scale spectral channels into spectral periods that follow the RGB color filter arrangement. These spectral periods then form a mosaic pattern across the surface of the filter. A pixel level mosaic filter divides the entire field of view of the sensor or imaging system into numerous miniature areas and assigns different constituent spectral channels of the filters to each of these areas. This allows simultaneous and efficient processing of information from multiple spectral ranges. Furthermore, the rich and delicate division of the spectral channel areas permits precise and potent control over the optical characteristics of the images.

Shalom EO offers Standard and Custom Pixel Level Mosaic Filters. The sizes of our pixel level mosaic filters can be tailored according to the sizes of the pixel size of the detector to achieve coordinating alignment between spectral channels and detector pixels. Featuring a highly integrated pattern of numerous spectral channels, our pixel level mosaic filter stands out when used as a spectroscopic element in an imaging spectrometer with the advantage of miniaturization and the lightweight design of the imaging spectrometer. An imaging spectrometer utilizing our pixel level mosaic filter as the core component can work in video imaging mode, overcoming the defect of the traditional imaging spectrometer that requires push-scan imaging and greatly improving the efficiency of spectral imaging. It can be applied in many high-precision fields such as camouflage identification, precision agriculture, geological survey, medical monitoring, and so on.

Transmission Curves:



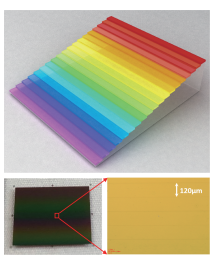
Specification:

Wavelength Range	450-1650nm	Peak Transmission Rate	＞60%
FWHM(nm)	＜10-40	Number of Spectral Channels	9 or 16
Single channel size (μm)	10/11/15/20	Size(mm)	9.60x7.68 11.264x11.264 12.80x10.24 22.528x22.528 or customized

Modules and Types:

WavelengthRange (nm)	Peak Transmission Rate (%)	FWHM(nm)	Number of Spectral Channels	SingleChannel	FWHM(nm)
450-570	＞60	＜12	9	10, 11	11.264x11.264
630-780	＞60	＜12	9	10, 11	11.264x11.264
450-570	＞60	＜10	16	11	22.528x22.528
559-740	＞60	＜10	16	11	22.528x22.528
700-920	＞60	＜10	16	11	22.528x22.528
980-1350	＞60	＜20	16	15	9.60x7.68
1350-1750	＞60	＜20	16	15	9.60x7.68
1150-1650	＞60	＜40	16	20	12.80x10.24

Pixel Level Stepped Filters



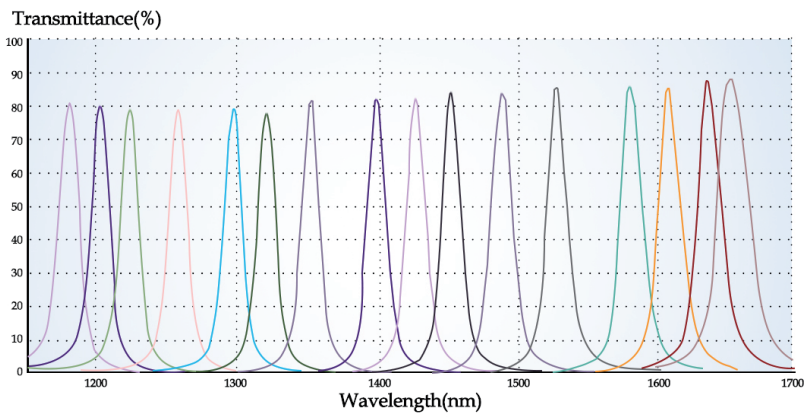
- Accurate spectral filtering
- Stepped Pattern Design, allowing for controlled and precise spectral separation
- Compact Design, suitable for integration into miniaturized imaging systems
- Applications in Remote Sensing and other fields require detailed spectral analysis
- Customizable Spectral Bands, providing flexibility in spectral selection

Pixel Level Stepped Filters or Pixel Level (Stepped) Hyperspectral Filters are a kind of specialized optical filters designed to divide the field of view of an imaging system into distinct spectral bands using a stepped pattern. The size of the spectral channel in the column direction is engineered to be an integer multiple of the detector pixel size, while in the row direction, it matches the size of the detector imaging surface. This design ensures full coverage of the detector imaging surface by the

filter, facilitating efficient filtering and capturing of all spectral information in the image. Consequently, it enhances the resolution and quality of spectral imaging because the loss of spectral imaging attributing to the aberrations in optical systems is abated, given that spectral signals obtained from each element of the optical system have a consistent response under the same conditions.

Shalom EO offers Standard and Custom Pixel Level Stepped Filters. We provide standard 32 channel or 64 channel pixel level stepped filters, regarding the custom channels, we offer a selection of channel numbers of 16 channels, 32 channels, and 64 channels. The arrangement patterns are available in multiple options, including one line of each channel in the center of the target plane, multi-channel periodic arrangement of the whole target plane, single channel and multi-line of the whole target plane coverage, etc. With their compact design, high-precision spectral filtering prowess, and high-spectral resolution, these pixel-level step filters provide excellent performance in demanding imaging and industrial environments.

Transmission Curves:



Specification:

Wavelength Range (nm)	1150-1650	Peak Transmission Rate (%)	＞ 75
Number of Spectral Channels	32 or 64	FWHM (nm)	＜ 40 or ＜ 15
Single Channel Size (μm)	320 or 240 or 15	Filter Size (mm)	9.60x7.68 12.8x10.24

Modules and Types:

Wavelength Range (nm)	Peak Transmission Rate(%)	FWHM(nm)	Number of Channels	SingleChannel Size (μm)	Filter Size (mm)
1150-1650	＞ 80	＜ 40	32	320	12.8x10.24
1150-1650	＞ 75	＜ 15	32	240	9.60x7.68
1150-1650	＞ 80	＜ 40	64	15	9.60x7.68
559-740	＞ 60	＜ 10	16	11	22.528x22.528

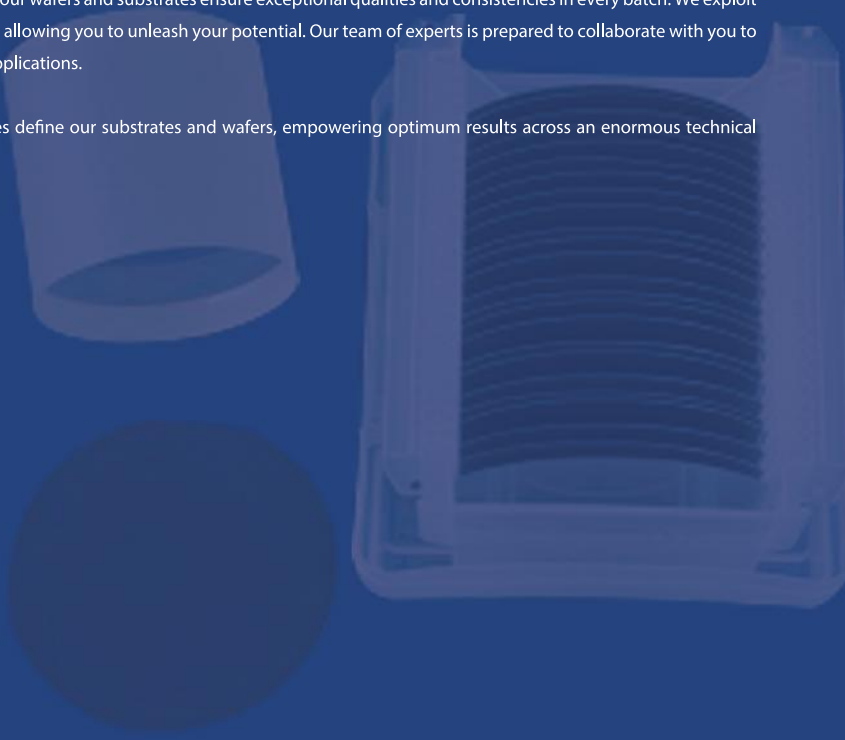
+04 Wafers and Substrates

Wafers and Substrates

Shalom EO offers a diverse catalog of standard and custom wafers and substrates oriented to meet the stringent demands of various applications. Our comprehensive range includes a wide selection of substrate and wafer materials:

Sapphire(Al_2O_3), LSAT, CZT, $LiNbO_3$, $LiTaO_3$, Langasite, GaSb, GaAs, MgO, GGG, Ge, STO, YSZ, TiO_2, BeO/SiC ceramics, etc. Categorized into SAW Wafers, $LiNbO_3$/$LiNbO_3$/Quartz Ultra Thin Films and Wafers, Optical Grade $LiNbO_3$/$LiTaO_3$ Crystal Wafers, Substrates and Wafers for Epitaxial Thin Film Growth, Glass Wafers, and Ceramic Wafers. Crafted from the finest materials with precision engineering, our wafers and substrates ensure exceptional qualities and consistencies in every batch. We exploit various substrate materials, crystal orientations, and surface finishes, allowing you to unleash your potential. Our team of experts is prepared to collaborate with you to develop custom wafers and substrates optimized for your unique applications.

At Shalom EO, precision engineering and uncompromising qualities define our substrates and wafers, empowering optimum results across an enormous technical domain.



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Sapphire (Al2O3) Substrates and Wafers



- Excellent mechanical and thermal robustness, anti-chemical corrosion, electrical insulation
- Maximum diameter: 6 inches, circular/square and custom shapes available
- Class 1000 clean room production and class 100 box/bag package
- Standard or Custom
- Orientations: C-Cut, A-Cut, R-Cut, M-Cut, or Custom
- Ideal for epitaxial thin film growth of various materials: III-V and II-VI compound semiconductors (Blue/White/Violet LEDs), Microelectronic IC applications (Silicon on Sapphire Integrated Circuit, SOS), Hybrid Microelectronics (HIC/MCM), ferromagnetic/ferroelectric thin film growth

Sapphire is an excellent substrate material for the epitaxial growth of various thin films. Sapphire has exceptional high-temperature resistance, chemical corrosion resistance, electrical insulation, wide optical transmission, unrivaled mechanical hardness, and wear resistance. The molecular bonding of sapphire is strong, enabling the production of thinner pieces without fracture.

Sapphire Wafers and Substrates are versatile, their uses include but are not limited to III-V and II-VI compound thin film growth for semiconductors, Light Emitting Diodes(LEDs), Y-series, La-series high-temperature superconducting (HTSC) thin films, Microelectronic IC (Silicon on Sapphire Integrated Circuit, SOS), Hybrid Microelectronic applications, and ferromagnetic/ferroelectric thin film growth.

Hangzhou Shalom EO offers off-the-shelf and custom sapphire substrates and wafers, the standard versions have a c-plane orientation, while other orientations including a-plane, r-plane, and m-plane are also available. The maximum diameter is 6 inches, and substrates could either be single-side polished or double-side polished. In addition to the standard circular shapes, other shapes like square and rectangular are also accessible. Shalom EO has eminent capabilities and endeavors to produce high-precision sapphire wafers. We select single crystal sapphire with superior sapphire purities to fabricate the wafers and substrates. A series of advanced equipment is utilized to manufacture our products in a class 1000 clean room. Before shipment, we conduct XRD diffraction analysis and use Atomic Force Microscope (AFM) to inspect the product to ensure optimum surface qualities of the product.

Specifications:

Materials	Al2O3 crystals or sapphire	Orientation Error	±0.5deg.
Orientation	A-plane	<11-20>	2.379Å
	R-plane	<1-102>	1.740Å
	M-plane	<10-10>	1.375Å
	C-plane	<0001>	2.165Å
Maximum Diameter	6 inches	Surface Finish	SSP (single surface polished) or DSP (double surface polished)

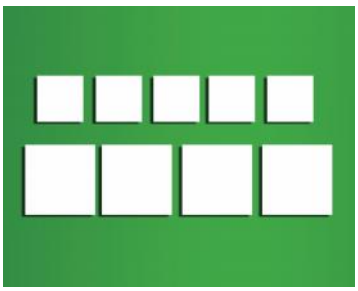
Basic Properties:

Crystal Structure	Hexagonal	Unit Cell Constant	a=4.748Å c=12.97Å
Melt Point（℃）	2040℃	Crystal Purity	99.99%
Density	3.98 （g/cm3）	Hardness	9 （mohs）
Thermal Expansion（/℃）	7.5 x10-6	Dielectric Constants	~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis
Thermal Conductivity（Calorie/℃ Cm.S）		⊥ c	//c
	23℃	0.055	26℃ 0.060
	77℃	0.040	70℃ 0.041

Product List :

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
6505-001	10x10mm	0.5mm	C-plane	SSP	Inquire
6505-002	10x10mm	0.5mm	C-plane	DSP	Inquire
6505-003	Φ12.7mm	0.5mm	C-plane	SSP	Inquire
6505-004	Φ12.7mm	0.5mm	C-plane	DSP	Inquire
6505-005	Φ25.4mm	0.5mm	C-plane	SSP	Inquire
6505-006	Φ25.4mm	0.5mm	C-plane	DSP	Inquire
6505-007	φ50.8mm	0.43mm	C-plane	SSP	Inquire
6505-008	φ50.8mm	0.4mm	C-plane	DSP	Inquire
6505-009	φ100mm	0.65mm	C-plane	SSP	Inquire
6505-010	φ100mm	0.5mm	C-plane	DSP	Inquire
6505-011	φ150mm	1.0mm	C-plane	SSP	Inquire
6505-012	φ150mm	1.0mm	C-plane	DSP	Inquire

Bare Beryllium Oxide（BeO）Ceramic Substrates



- Outstanding Thermal Inductance, Maximum 280W/m.k
- Substantial Puncture Strength and High Electrical Resistance
- low loss at high frequencies, low dielectric constants
- Hot-press techniques
- Various custom shapes, specifications
- Applications: TEC, HIC, PCB, high-power, large-scale integrated circuits, electrical packages, aerospace, telecommunications, satellites

Hangzhou Shalom EO offers Bare Beryllium Oxide Ceramic Substrates of various custom shapes and specifications, and special structures such as holes, manufactured using hot-press techniques, which allows us to obtain quick turnaround at competitive prices. Our Beryllium Oxide ceramic substrates feature high BeO purities and unrivaled thermal inductance, with the maximum reaching 280W/m.K. The uncoated bare substrates are appropriate for further thick film treatment to produce PCB substrates and for diverse applications like high-power, large-scale integrated circuits, electrical packages, TEC, HIC, PCB, aerospace, telecommunications, satellites, etc. Besides, we also offer metalized versions of BeO ceramic substrates.

Application Notes:

It's worth noting that although Beryllium Oxide ceramics have been notorious for being deemed to be toxic, it's the soluble BeO power that's toxic. Beryllium Oxide ceramics, however, having gone through high-temperature processing, are insoluble in common acids and alkalis, therefore are not as detrimental as believed under proper protection measures. Shalom EO's Beryllium Oxide ceramic substrates are all produced and tested in compliance with pertinent regulations.

Specifications:

Note: Shalom EO offers substrates made from two different models (BEO99 and BEO99.5) of BeO Ceramics. The specifications of the two models are separately listed in the table below.

Parameters/Models		BEO99	BEO99.5
Volume Density		≥2.85g/cm3	≥2.88g/cm3
Flexural Strength		≥200Mpa	≥200Mpa
Average Coefficient of Expansion (at 25-500°C)		7.0-8.0x10-6/K	7.0-8.0x10-6/K
Thermal Conductivity	at 25°C	≥260W/m.K	≥285W/m.K
	at 100°C	≥190W/m.K	200W/m.K
Dielectric Constants	at 1MHz	6.7±0.2	
	at 10GHz	6.9±0.2	6.8±0.2
Dielectric Loss Tangent	at 1MHz	≤4x10-4	≤4x10-4
	at 10±0.5GHz	≤6x10-4	≤4x10-4
Volume Resistivity		≥1014 Ω.cm (at 20 °C)	≥1014 Ω.cm (at 100 °C)
Puncture Strength		≥30kV/mm	≥40kV/mm
Thermal Shock Resistance		Excellent	Excellent
Chemical Stability	1:9 HCL	≤0.1mg/cm2	≤0.1mg/cm2
	10% NaOH	≤0.1mg/cm2	≤0.1mg/cm2
Air Tightness		≤5x10-12Pa.m3/s	≤5x10-12Pa.m3/s
Average Grain Size		10-20μm	10-20μm

Thick Flim Metalized Beryllium Oxide（BeO) Ceramic Substrates



- Outstanding Thermal Inductance, dimensional tolerances <0.02mm
- Thick-Film Metalization Techniques
- Metal Coating: WMn, MoMn plus activators, additional nickel plating
- Custom shapes, specifications, circuit patterns
- Applications: high-power and large-scale integrated circuits, PCB, TEC, HIC, aerospace, hermetic electrical packages, satellites

Thick Film Metalized ceramic substrates, are ceramic substrates screened with conductor, resistor, resistor metal pastes, and fired. Beryllium Oxide (Beryllia/BeO) Ceramics are a kind of high-performance fine ceramic material with unparalleled thermal induction properties. Shalom EO's Thick Film Metalized BeO Ceramic Substrates are manufactured using thick-film WMn/MoMn metallization with nickel electroplating, delivering great bonding force, high weldabilities, and excellent tensile strength (>20MPA). Our thick film metalized ceramic substrates feature high ruggedness and minimized possibilities of outgassing, with the additional assurance that the nickel platings do not blister.

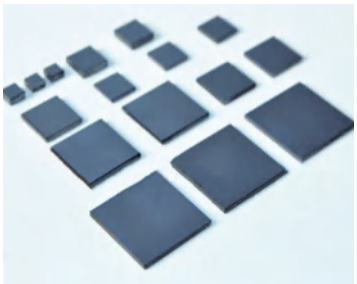
For the circuit-pattern-distributed versions, Shalom EO is capable of retaining the dimensional tolerances of the lines within 0.02mm. High-precision laser-cut ceramic substrates are also available in Shalom EO, where tight geometric monitoring could be realized through a series of laser-processing techniques, including laser-cutting, laser-drilling, laser-marking, etc. Our Thick Film Metalized Beryllium Oxide ceramic substrates are excellent platforms for wire bonding, ideal preforms of microwave PCBs, TEC for lasers, HIC for automotive, high-power semiconductor modules, and hermetic electrical packaging.

Specifications:

Note: Shalom EO offers substrates made from two different models (BEO99 and BEO99.5) of BeO Ceramics. The specifications of the two models are separately listed in the table below.

Parameters/Models		BEO99	BEO99.5
Volume Density		≥2.85g/cm3	≥2.88g/cm3
Flexural Strength		≥200Mpa	≥200Mpa
Average Coefficient of Expansion (at 25-500°C)		7.0-8.0x10-6/K	7.0-8.0x10-6/K
Thermal Conductivity	at 25°C	≥260W/m.K	≥285W/m.K
	at 100°C	≥190W/m.K	200W/m.K
Dielectric Constants	at 1MHz	6.7±0.2	
	at 10GHz	6.9±0.2	6.8±0.2
Dielectric Loss Tangent	at 1MHz	≤4x10-4	≤4x10-4
	at 10±0.5GHz	≤6x10-4	≤4x10-4
Volume Resistivity		≥1014 Ω.cm (at 20 °C)	≥1014 Ω.cm (at 100 °C)
Puncture Strength		≥30kV/mm	≥40kV/mm
Thermal Shock Resistance		Excellent	Excellent
Chemical Stability	1:9 HCL	≤0.1mg/cm2	≤0.1mg/cm2
	10% NaOH	≤0.1mg/cm2	≤0.1mg/cm2
Air Tightness		≤5x10-12Pa.m3/s	≤5x10-12Pa.m3/s
Average Grain Size		10-20μm	10-20μm

CdZnTe (CZT) Wafers and Substrates



- Excellent electrical properties, low dark current, and superior thermal stabilities
- For epitaxial growth of HgCdTe (MCT)
- Cutting-edge choice for IR detectors (IR Transmission≥60%)
- Room temperature operation
- Surface Roughness(Ra)≤0.5nm
- Application fields: semiconductor radiation detectors, photorefractive gratings, electro-optic modulators, solar cells, and terahertz generation

Cadmium Zinc Telluride (CZT /CdZnTe) Substrate, is a compound of cadmium, zinc, and tellurium with excellent electrical properties, low dark current, and superior thermal stabilities.

Due to its similar lattice constant to HgCdTe (MCT), the CdZnTe (CZT) substrate is a traditional option for HgCdTe (MCT) epitaxial thin film growth. And owing to the MCT epitaxial thin film's transmittance to infrared (IR) wavelengths, despite the difficulties in growing a large area of affordable high-quality substrates, CZT wafers remain the best choice for infrared detectors, photorefractive gratings, electro-optic modulators, solar cells, and terahertz generators.

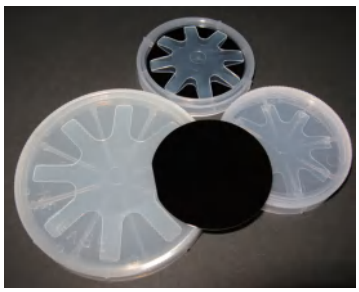
As a direct bandgap semiconductor with high atomic numbers, infrared devices based on CZT substrates continue to be the cutting-edge choices in the market in terms of sensitivities and being reliable. CZT substrates offer effective conversion of photons to electrons with high resolutions as a media of radiation detection, facilitating various tasks including medical imaging, scientific research, and industrial inspection. Also, radiation detectors using CZT can operate in direct-conversion (or photoconductive) mode at room temperature. The low dark current makes CZT substrates advantageous in conditions where light is insufficient, and the thermal stabilities render them suitable for high-temperature environments.

Hangzhou Shalom EO offers custom CZT substrates and wafers according to the customer's request, with a fine surface roughness of ≤0.5nm, packaged in class 1000 clean room vacuum packaging.

Specifications:

Materials	Cd1-xZnxTe，x=0.04	Type	p-type
Size(mm3)	14×14×1.3, 10×10×1	Index of Crystal Face	(111), (211)
Orientation and Accuracy	Low index surface orientation, Orientation Accuracy ≤0.3°	Resistivity	ρ ＞ 106 Ω·cm
IR Transmission%	≥60%	Infrared Imaging	Te inclusions≤ 2μm or Cd inclusions≤2μm
X-ray DCRC FWHM(FWHM)	≤30 rad·s	Average Etch Pit density(EPD)	1x104/cm2 ~ 5x104/cm2
Surfaces Roughness	Ra≤0.5 nm	Packaging	1000 class clean room, vacuum packaging
Storage Temperature	22 ℃ ~ 25 ℃	Storage Humidity	45% ~ 60%

Gallium Arsenide (GaAs) Crystals and Wafers



- Zinc blende crystal lattice structure and electron mobility 5 to 6 times greater than silicon
- Good performance under high frequency, high and low temperature, low noise, and high radiation tolerance
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Applications: epitaxial growth of other III-V semiconductors, microwave frequency integrated circuits, monolithic microwave integrated circuits, infrared light-emitting diodes, laser diodes, solar cells and optical windows

Gallium Arsenide (GaAs) Crystal is a crystalline compound of the elements gallium and arsenic. It is a III-V direct bandgap semiconductor with a Zinc blende crystal structure.

The fundamental function of GaAs wafers is to be used as a substrate material for the epitaxial thin film growth of other III-V semiconductors including indium gallium arsenide, aluminum gallium arsenide, etc. This kind of substrate has good performance under high frequencies, high temperature and low temperature, low noise, high radiation tolerance, and higher electron mobility than silicon which makes them suitable for high-frequency applications like radio frequency (RF) and microwave devices. In addition, GaAs have a direct bandgap, enabling efficient emission and absorption of light, making it ideal for optoelectronic devices like high-density p-i-n detectors and laser diodes with robust silicon electronic integrated circuits.

Hangzhou Shalom EO offers custom GaAs crystals, wafers, and substrates, which are suitable for the application of epitaxial growth, microwave, IR LED, laser diodes, solar cells, and infrared optical windows.

Specifications:

Orientation	(100) 0°±0.5°, (100) 2°±0.5°off toward <111>A, (100)15°±0.5°off toward <111>A	Size(mm)	25×25×0.3, 10×10×0.35, 10×5×0.35, 5×5×0.35
Polishing	SSP (single surface polished) or DSP (double surface polished)	Surface Roughness	≤5Å

Basic Properties:

Growth Method	VGF/ HB	Crystal Structure	Zinc Blende
Appearance	Very dark red, vitreous crystals	Density	5.3176 g/cm3
Lattice Constant	5.65×10-10m	Molar Mass	144.645 g•mol-1
Band Gap@300 K	1.424eV	Electron Mobility @300K	8500 cm2/(V×s)
Thermal Conductivity@300K	0.55 W/(cm×K)	Chemical Stability	Insoluble in water, ethanol, methanol, and acetone. Soluble in HCl.
Refractive Index	3.3	Packaging	class 1000 clean room vacuum packaging

Single Crystal	Doping	Conduction Type	Carrier Concentration	Dislocation Density
GaAs	Si	No	>5×1017 cm-3	<5×105 cm-2

Gallium Nitride (GaN) Crystals and Wafers



- Wide direct band gap, strong atomic bonds, and High thermal capacity/conductivity
- Stable physical and chemical properties
- Excellent optoelectronic properties in the short wavelength range
- Typical orientation of GaN wafers: C-Axis or <0001>
- Applications: blue, green, and UV-light LED, blue and UV light laser diodes (LD), high-power electronic devices, and high-frequency electronic devices

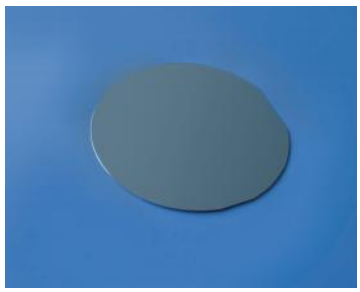
Gallium Nitride (GaN) is a semiconductor material with a wide direct bandgap (3.4 eV), strong atomic bonds (which contribute to its stable physical and chemical properties), exceptional thermal properties, and excellent radiation resistance. GaN (Gallium Nitride) crystals and wafers exhibit superior optoelectronic properties at short wavelengths, making them useful in LED applications (blue, green, UV-light) and ultraviolet detectors. GaN crystals and wafers are also suitable for manufacturing high-temperature semiconductor devices.

Hangzhou Shalom EO offers custom gallium nitride wafers and substrates according to customer's request, options including N-type and semi-insulating types of GaN wafers are available. Our gallium nitride crystals and wafers are widely used in various LEDs, blue light laser diodes ultra-violet (UV) laser diodes (LD), and electronic devices operating at high power and high frequencies.

Specifications:

Type	GaN-FS-10	GaN-FS-15
Size	10.0mm×10.5mm	14.0mm×15.0mm
Thickness	Rank 300, Rank 350, Rank 400	300 ± 25 μm, 350 ± 25 μm, 400 ± 25 μm
Orientation	C-axis(0001) ± 0.5°	
TTV	≤15 μm	
BOW	≤20 μm	
Carrier Concentration	>5x1017/cm3	/
Conduction Type	N-type	Semi-Insulating
Resistivity(@300K)	< 0.5 Ω•cm	>106 Ω•cm
Dislocation Density	Less than 5x106 cm-2	
Usable Surface Area	> 90%	
Polishing	Front Surface: Ra < 0.2nm. Epi-ready polished Back Surface: Fine ground	
Package	Packaged in a class 100 clean room environment, in single wafer containers, under a nitrogen atmosphere.	

Gallium Antimonide (GaSb) Crystals and Substrates



- Matches well with each ternary, quaternary, and III-V compound
- Maximum diameter: 3 inches
- Non-doping, Zn-doped, and Te-doped GaSb are available.
- Surface Roughness: Ra≤0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Applications: Infrared optical fiber transmission, potential application in the microwave field

Gallium Antimonide (GaAs) is used as a substrate material for the epitaxial growth of heterostructures, which are harnessed for optoelectronic applications. The lattice constant of GaSb matches well with various ternary, quaternary, and III-V compound solid solutions whose bandgap covers 0.8–4.3 μm, which makes it a good substrate material used in infrared optical fiber transmission. With higher lattice-restricted mobility than GaAs, GaSb is expected to have good prospects in the field of microwave.

Hangzhou Shalom EO offers custom GaSb crystals and substrates according to the customer's request, the maximum diameter of 3" is available. Three types of GaSb materials: non-doping, Zinc (Zn) doped and Tellurium (Te) doped GaSb are offered. All substrates are stringently tested and packed in class 1000 clean room and class 100 bags.

Specifications:

Material	GaSb single crystal	Orientation	<100>
Crystal Structure	Cube	Density	5.53g/cm3
Melt Point	712℃	Bandgap(@300 K)	0.67eV
Band Gap@300 K	10x10x0.5mm, 5x5x0.5mm, D50.8x0.5mm, D76.2x0.5mm	Surface Roughness	Ra≤0.5nm5Å
Size(mm)	SSP (single surface polished) or DSP (double surface polished)	Package	class 1000 clean room, class 100 bags

Chemical Properties of GaSb Crystal:

Single Crystal	Doping	Conduction Type	Carrier Concentration	Mobility Ratio	Dislocation Density
GaSb	/	P	(1-2)×1017	600-700	<1x104
GaSb	Zn	P	(5-100)x1017	200-500	<1x104
GaSb	Te	N	(1-20)x1017	2000-3500	<1x104

Germanium (Ge) Crystals and Substrates



- High purity and low surface roughness(Ra)≤5Å (5μm×5μm)
- High chemical stability and good photoelectric performance
- For epitaxial growth or layer-scale transfer of III-V compounds
- Germanium Lenses and Germanium windows for infrared application available
- Various doping options: No doping (R>35Ωcm) or Sb-doped (R=0.05Ωcm) or Ga –doped (R0.05~0.1Ωcm)

Germanium (Ge) is a rare metal and semiconductor material and contains many unique properties and merits. The benefits of Ge include strong chemical resistance, easy processing, high and uniform transmittance, large refractive index, high radiation resistance, and good photoelectric performance. Germanium or Ge substrates are an excellent alternative for epitaxial growth and layer transfer of III-V compounds, because of the similar lattice constants, germanium substrates can be used to make gallium arsenide solar cells.

Germanium substrates are excellent for manufacturing semiconductors, infrared optics, and solar cells. Germanium has a higher intrinsic carrier concentration compared to silicon, making it useful for applications requiring high speed. Germanium is less expensive and more mechanically strong than GaAs, therefore Ge substrates can have a larger length-to-thickness ratio, reducing the weight and cost.

Hangzhou Shalom EO provides germanium crystals, wafers, and substrates that are precisely "off-cut" towards the appropriate directions and packaged in class 1000 clean room and class 100 bags.

Specifications:

Orientation	<100>, <110>, <111>±0.5°	Size(mm)	10x3, 10x5, 10x10, 15x15, 20x15, 20x20 dia2"x 0.33mm dia2"x 0.43mm 15 x 15 mm
Thickness	0.5mm, 1.0mm	Polishing	SSP (single surface polished) or DSP (double surface polished)
Ra	≤5Å(5μm×5μm)		

Basic Properties:

Growth Method	Czochralski	Crystal Structure	M3
Lattice Constant	a=5.65754 Å	Density	5.323g/cm3
Melt Point	937.4℃		
Doping Material	No Doping	Sb-doped	Ga –doped
Type	/	N	P
Resistivity	>35Ωcm	0.05Ωcm	0.05~0.1Ωcm
EPD	<4×103/cm2	<4×103/cm2	<4×103/cm2

GGG Substrates and Wafers



- Exceptional magneto-optical properties, low dielectric loss and high thermal conduction
- Maximum diameter: 4 inches; typical thickness 0.5/1.0mm
- Clean package: class 1000 clean room and class 100 bags
- Typical Orientation of GGG substrates: ＜100＞, ＜110＞ and ＜111＞
- Excellent as magneto-optical isolator, microwave epitaxial substrates, and HTS substrates
- Applications: magneto-optical films (such as YIG or BIG thin film) growth, excellent as optical, microwave isolator and High-Temperature Superconductor (HTS) substrates

Gadolinium Gallium Garnet (GGG) single crystal is a material with exceptional magneto-optical properties, low dielectric loss, and high thermal conduction which make it promising for use in the fabrication of various optical magneto-optical components as well as for epitaxial growth of microwave elements and high-temperature superconductors. GGG substrates can be incorporated into infrared optical isolator (operating from 1.3μm to 1.5μm), which comprises YIG or BIG film deposited on the Gadolinium Gallium Garnet (GGG) substrate combined with birefringence parts. GGG substrates enable the fabrication of high-performance optoelectronic devices such as microwave isolators, light-emitting diodes (LEDs), and photodetectors.

Hangzhou Shalom EO provides standard epi-ready GGG substrates and wafers, custom wafers are also available upon request.

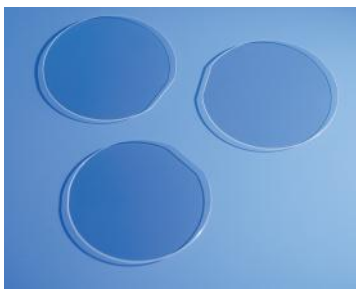
Specifications:

Material	GGG single crystals	Orientation	＜100＞,<110>,<111>
Orientation Error	±0.5°	Maximum Diameter	4 inches
Typical Thickness	0.5mm,1.0mm	Size Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	Ra<0.5nm	Cleanness and Package	class 1000 clean room, class 100 bags

Product List

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
6506-001	5x5mm	0.5mm	<100>	SSP	Inquire
6506-002	5x5mm	0.5mm	<110>	SSP	Inquire
6506-003	5x5mm	0.5mm	<111>	SSP	Inquire
6506-004	10x10mm	0.5mm	<100>	SSP	Inquire
6506-005	10x10mm	0.5mm	<110>	SSP	Inquire
6506-006	10x10mm	0.5mm	<111>	SSP	Inquire
6506-007	Φ12.7mm	0.5mm	<111>	SSP	Inquire
6506-008	Φ12.7mm	0.5mm	<111>	DSP	Inquire
6506-009	Φ25.4mm	0.5mm	<111>	SSP	Inquire
6506-010	φ25.4mm	0.5mm	<111>	DSP	Inquire
6506-011	φ50.8mm	0.5mm	<111>	SSP	Inquire
6506-012	φ50.8mm	0.5mm	<111>	DSP	Inquire
6506-013	φ76.2mm	0.5mm	<111>	SSP	Inquire
6506-014	φ76.2mm	0.5mm	<111>	DSP	Inquire

Glass Wafers and Substrates



- Brands: SCHOTT Borofloat33/B270/D263/N-BK7/Zerodur, Corning Pyrex and Eagle XG, CDGM (China) H-K9L/H-ZF/MJB5
- Specifications compliant with SEMI Standards and QC inspected
- Fused Silica Wafers and Substrates are also available
- Custom dimensions and shapes upon request
- Typical applications: Semiconductor applications, Substrates for Coating of Optical Components (Optical Mirrors, Filters, etc), Microfluidic Chips, LCD, and others

Glass Wafers and Substrates are thin discs or squares of glass materials. The term glass means a vitreous solid formed by rapid cooling after the raw ingredients are heated toward their liquid state.

Shalom EO offers Glass Wafers and Substrates made from glass equivalent to SCHOTT Borofloat33/B270/D263/N-BK7/Zerodur, Corning Pyrex and Eagle XG, CDGM H-K9L/H-ZF/MJB5, and conventional Soda Lime Glass, etc. Glass substrates coated with ITO (Indium Tin Oxide) conducting film for LCD (Liquid Crystal Display) are also available. The advantages of these glass materials include superior thermal and chemical stability, excellent dielectric properties, high spectral optical transmission, etc., which differ according to the glass type.

The wafers and substrates could be provided either in polished (single side or double side optional) versions for high-end applications or unpolished versions at economized prices, where Shalom EO utilizes an abrasion-free lapping and CNC machining process, to achieve exceptionally low Total Thickness Verification (TTV), tight geometric deviations and the desired flatness. Cautious inspections are carried out in clean room before deliveries to ensure qualities are compliant with the SEMI standards.

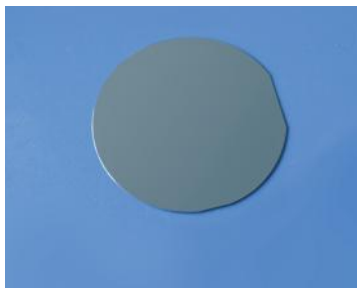
The lowest thickness is down to 3um, and a wide spectrum of Thermal Expansion Coefficients is accessible, with other specifications (shapes, dimensions, material selection, etc.) free for customization. We are also willing to offer constancy at your request.

Specifications:

Note: The Specifications of Standard Glass Wafers and Substrates are listed below, other custom modules with Diameters up to 450mm, and Minimum Thickness of 30μm are available.

Item (Standard)	4 inch	6 inch	8 inch	12 inch
Brands and Materials	SCHOTT Borofloat33/B270/BK7/D263, Corning Eagle XG/Pyrex, CDGM H-K9L/H-ZF/MJB5, Soda Lime Glass			
Diameter (of Round or Square Shape)	100mm	150mm	200mm	300mm
Dimension Tolerance	±0.3mm	±0.3mm	±0.3mm	±0.5mm
Thickness	≥0.15mm	≥0.25mm	≥0.3mm	≥0.3mm
Primary Flat	32±2mm	57.5/42±2mm	Notch	Notch
LTV (5mmx5mm)	<1μm	<1μm	<1μm	<2μm
TTV	<1.5μm	<3μm	<5μm	<5μm
Bow	±20μm	±30μm	±40μm	±50μm
Warp	≤25μm	≤30μm	≤50μm	≤60μm
PLTV (0.5μm within 5mmx5mm)	≥95%	≥95%	≥95%	≤95%
Edge Bevel	According to IEC62276&SEMI M1.2 Standard			
Polished Side Roughness(Ra)	≤1nm			
Surface Quality, S/D	40/20			

Indium arsenide (InAs) Crystals and Substrates



- High mobility ratio and low dislocation density
- Good lattice integrity, appropriate electrical parameters, and high homogeneity
- Substrate material for heterojunction materials and epitaxial growth of AlGaSb
- Surface Roughness(Ra)≤5Å
- Application fields: infrared devices, medium wave infrared quantum cascade laser(QCL), gas monitoring, Hall semiconductors, etc.

Indium Arsenide (InAs) single crystal is often used as the substrate material to grow heterojunction materials (InAsSb/In－AsPSb, InNAsSb), which can be utilized to manufacture infrared-emitting devices within the wavelength range 2～14μm. Indium Arsenide （InAs) can also be used as a substrate material for the epitaxial growth of AlGaSb with a superlattice structure for medium wave infrared quantum cascade laser(QCL). InAs are widely used in gas monitoring and low-loss optical fiber communication. With a high mobility ratio, it is an ideal material for Hall semiconductors. As a single-crystal substrate, Indium Arsenide has low dislocation density, good lattice integrity, appropriate electrical parameters, and high homogeneity. The main growth method of this material is the classical liquid encapsulation pulling method (LEC).

Hangzhou Shalom EO offers custom Indium Arsenide substrate and wafers according to the request, with a good surface roughness of less than 0.5nm and packaged in class 1000 clean room and class 100 bags.

Specifications:

Material	InAs single crystal	Orientation	〈100〉
Crystal Structure	Cube	Density	5.66g/cm3
Melt Point	942℃	Bandgap(@300 K)	0.45eV
Size(mm)	10x10x0.5mm, 5x5x0.5mm, D50.8x0.5mm, D76.2x0.5mm	Surface Roughness	Ra≤5Å
Polishing	SSP (single surface polished) or DSP (double surface polished)	Package	class 1000 clean room, class 100 bags

Modules and Types:

Single Crystal	Doping	Conduction Type	Carrier Concentration	Mobility Ratio	Dislocation Density
InAs	/	N	5x1016	2x104	<5x104
InAs	Sn	N	(5-20)x1017	>2000	<5x104
InAs	Zn	P	(1-20)x1017	100-300	<5x104
InAs	S	N	(1-10)x1017	>2000	<5x104

Indium Phosphide (InP) Wafers and Substrates



- High electron mobility, good radiation stability, and large band gap
- Surface Roughness(Ra)≤5Å
- For epitaxial growth of indium gallium arsenide
- Superior performance in high-power and high-frequency electronics
- S/Fe/Zn doping optional
- Application fields: optical fiber communication, microwave, millimeter wave(MMV), radiation-resistant solar cells, Etc.

Indium Phosphide (InP) is an important III-V compound and semiconductor material with the advantages of high electron mobility, good radiation stability, and large band gap. It has a face-centered cubic ("zincblende") crystal structure, identical to that of GaAs and most of the III-V semiconductors. InP is used as a substrate for epitaxial indium gallium arsenide-based optoelectronic devices. With stable physical and chemical properties, InP finds versatile usages in optical fiber communication, microwave, millimeter wave (MMV), radiation-resistant solar cells, and other fields.

Indium Phosphide (InP) is also utilized in high-power and high-frequency electronics (High-electron-mobility transistor, Heterojunction bipolar transistor) because of its superior electron velocities. It was used with indium gallium arsenide to make record-breaking pseudomorphic heterojunction bipolar transistors that could operate at 604 GHz.

Hangzhou Shalom EO offers Custom Indium Arsenide substrate and wafers according to the customer's request, with a good surface roughness of less than 0.5nm and packaged in class 1000 clean room and class 100 bags.

Specifications:

Material	InP single crystal	Orientation	〈100〉
Size(mm)	Dia50.8×0.35mm,10×10×0.35mm	Density	5.66g/cm3
Polishing	SSP (single surface polished) or DSP (double surface polished)		

Chemical Properties of InP Crystal:

Single Crystal	Doping	Conduction Type	Carrier Concentration	Mobility Ratio	Dislocation Density	Standard Size
InP	/	N	(0.4-2)×1016	(3.5-4) ×103	5×104	Φ2"×0.35mm Φ3"×0.35mm
InP	S	N	(0.8-3) ×1018 (4-6) ×1018	(2.0-2.4) ×103 (1.3-1.6) ×103	3×104 2×103	Φ2"×0.35mm Φ3"×0.35mm
InP	Zn	P	(0.6-2) ×1018	70-90	2×104	Φ2"×0.35mm Φ3"×0.35mm
InP	Fe	N	107-108	≥2000	3×104	Φ2"×0.35mm Φ3"×0.35mm

Basic Properties:

Crystal Structure	Tetrahedral(M4)	Lattice Constant	a = 5.869 Å
Density	4.81g/cm3	Melt Point	1062 °C
Molar Mass	145.792 g/mol	Appearance	Black cubic crystals
Chemical Stability	Slightly soluble in acids	Electron Mobility(@300K)	5400 cm2/(V·s)
Bandgap(@300 K)	1.344eV	Thermal Conductivity(@300K)	0.68 W/(cm·K)
Refractive Index	3.55(@632.8nm)		

Potassium Tantalate (KTaO3) Crystals and Substrates



- Typical thickness 0.5/1.0mm
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Orientation of KTaO3 substrates: ＜100＞, ＜110＞ and ＜111＞
- Applications: ferroelectric devices, epitaxial thin film growth for perovskite materials, High Temperature Superconductor (HTSC) film growth, and semiconductors

Potassium tantalate (or KTaO3) single crystal has a perovskite crystal structure, characterized by its cubic lattice arrangement of potassium, tantalum, and oxygen ions. This structure confers upon KTaO3 a series of intriguing properties including excellent ferroelectric properties, high dielectric constant, and low dielectric loss, transmittance to the VIS and NIR spectra, and high melting point. KTaO3 finds versatile applications as ferroelectric devices, substrates for epitaxial growth of thin films of other perovskite materials, such as complex oxides and high-temperature superconductors, or optical components.

The ferroelectric behavior of KTaO3 at low temperatures enables reversible polarization switching under an external electric field, a trait exploited in ferroelectric memory devices. In addition, KTaO3 possesses a wide transmission range spanning from ultraviolet to infrared wavelengths, making it suitable for optical applications. Its piezoelectric properties further extend its utilities in sensors, actuators, and acoustic devices.

Hangzhou Shalom EO offers KTaO3 crystals and wafers, the unique properties of our KTaO3 crystals and substrates render them indispensable in a diverse range of applications including high-performance capacitors, microwave devices, and ferroelectric memories, waveguides, substrates for epitaxial growth, etc.

Specifications:

Materials	KTaO3 crystals	Orientation	<100> <110> <111>
Orientation Error	±0.5deg	Typical Size (mm)	10x3, 10x5, 10x10, 15x15, 20x15, 20x20
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP (single surface polished) or
DSP (double surface polished)	936 °C (3)	Thermal Conductivity	58.61 W m-1 K-1 at 293K (6)
Roughness	Ra<0.5nm		

Basic Properties:

Melting Point	1352.2 ℃	Density	7.025 g/cm3
Mohs Hardness	6	Refractive Index	2.226@633nm, 2.152@1539nm
Coefficient of Thermal Expansion	4.027 x 10-6/K	Specific Heat (Temperature J/(Kg)	0.378
Transparent Wavelength Range (nm)	380~4000		

Lanthanum Aluminate (LaAlO3) Substrates



- Maximum diameter: 3 inches, typical thickness 0.5/1.0mm
- Orientation of LaAlO3 substrates: ＜100＞,＜110＞,＜111＞
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room, class 100 bags
- Applications: epitaxial growth of high temperature superconductors (HTS), magnetic and ferroelectric thin films, low loss microwave and dielectric resonance applications

LaAlO3 (Lanthanum aluminate) single crystal with a perovskite crystal structure, has a good lattice match to multiple materials with a similar perovskite structure. Its wide bandgap, thermal stabilities, and low dielectric loss make it excellent for applications in electronics of high frequencies, optics, and indispensable platforms for the epitaxial growth and research of thin films and heterostructures. Various materials can be grown on LaAlO2, including complex oxides, high-temperature superconductors, magnetic materials, and multiferroics. LaAlO3 exhibits a high dielectric constant, making it useful in capacitor applications.

Hangzhou Shalom EO provides stock epi-ready LaAlO3 wafers and custom LaAlO3 wafers upon request.

Specifications:

Material	LaAlO3 crystals	Orientation	＜100＞, ＜110＞, ＜111＞
Orientation Error	±0.5°	Maximum Diameter	3 inches
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	Ra<0.5nm	Cleanness and Package	class 1000 clean room, class 100 bags

Product List:

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
645-001	5x5mm	0.5mm	<100>	SSP	Inquire
645-002	5x5mm	0.5mm	<100>	DSP	Inquire
645-004	5x5mm	0.5mm	<111>	SSP	Inquire
645-005	10x10mm	0.5mm	<100>	SSP	Inquire
645-006	10x10mm	0.5mm	<100>	DSP	Inquire
645-007	10x10mm	0.5mm	<110>	SSP	Inquire
645-008	10x10mm	0.5mm	<111>	SSP	Inquire
645-009	φ25.4mm	0.5mm	<100>	SSP	Inquire
645-010	φ25.4mm	0.5mm	<100>	DSP	Inquire
645-011	Φ50.8mm	0.5mm	<100>	SSP	Inquire
645-012	Φ50.8mm	0.5mm	<100>	DSP	Inquire
645-013	Φ76.2mm	0.5mm	<100>	SSP	Inquire
645-014	Φ76.2mm	0.5mm	<100>	DSP	Inquire
6506-014	φ76.2mm	0.5mm	<111>	DSP	Inquire

Strontium Lanthanum Aluminate (SrLaAlO4) Crystals and Wafers



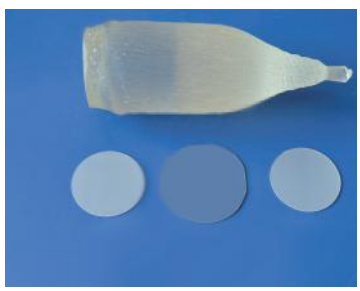
- Lower coefficient of thermal expansion than the other perovskite structure crystals
- Maximum Diameter: 20mm
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Orientation of SrLaAlO4 substrates: ＜001＞
- Applications: complex oxides, high-temperature superconductors, microwaves, high-frequency applications, etc.

Strontium lanthanum aluminate (SrLaAlO4), is a perovskite crystal that shares similarities with SrTiO3 but with a more stable structure and fewer defects. SrLaAlO4 crystal has an excellent lattice match with high-temperature superconductor Yttrium Barium Copper Oxide (YBCO) and other perovskite structure superconductors, which makes it advantageous for growing high TC superconducting films. Compared with other perovskite crystals, SrLaAlO4 has lower thermal expansion coefficients, therefore it can be used to grow films at a lower temperature, improving the lattice mismatch and reducing stress. The low dielectric constants make SrLaAlO4 crystals and wafers superior for microwaves and applications of high-frequencies.
Hangzhou Shalom EO provides custom Strontium lanthanum aluminate crystal wafers.

Specifications:

Material	LaSrAlO4 crystals	Orientation	＜001＞
Orientation Error	±0.5°	Maximum Diameter	20mm
Typical Size	5x5, 10x10,φ12.7mm, φ15mm, φ20mm	Typical Thickness	0.5mm, 1.0mm
Thickness Tolerance	±0.05mm	Size Tolerance	±0.1mm
Surface Finish	SSP or DSP	Roughness	Ra<0.5nm
Cleanness and Package	class 1000 clean room, class 100 bags		

Lithium Aluminate (LiAlO2) Crystals and Substrates



- LiAlO2 remains stable in high-temperature reducing atmospheres, melting point of 1900℃
- Provides LiAlO2 substrates up to 2" in diameter, ensuring high surface roughness
- Available in various sizes (mm) and diameters (Φ), thickness options of 0.5mm or 1.0mm, with orientations including <100> and <001>, and customization available upon request.
- Excellent for III-V nitride thin film growth

Lithium Aluminate (LiAlO2) single crystal with a corundum structure is an exceptional optional as the substrate for III-V nitride thin films since the lattice mismatch between LiAlO2 and Gallium Nitride (GaN) is only 1.4%. LiAlO2 substrate exhibits high chemical stabilities to withstand high-temperature reducing atmosphere. Single-oriented GaN film can be grown on LiAlO2 substrates without using low-temperature buffer layers. Hangzhou Shalom EO can provide LiAlO2 substrates up to 2" in diameter, with high surface roughness and clean packaging.

Specifications:

Size(mm)	10×3, 10×5, 10×10, 15×15, 20×15, 20×20 Φ15, Φ20, Φ1〞, Φ2〞, Φ2.6〞	Thickness	0.5mm,1.0mm
Orientation	<100>, <001>	Orientation Tolerance	±0.5°
Note	Special size and orientation are available upon request	Redirection the Edge	2°(special in 1°)
Surface Roughness	≤5Å(5μm×5μm)	Polishing	SSP (single surface polished) or DSP (double surface polished)

Basic Properties:

Crystal Structure	M4	Lattice Constant	a=5.17 Å c=6.26 Å
Melt Point(℃)	1900	Density	2.62 g/cm3
Hardness	7.5(mohs)	Color and Appearance	Transparent

Langasite (LGS) Crystals and Wafers



- Optimized for surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices
- High thermal stability with temperature up to 900 ℃
- High electro-mechanical coupling factor (15.8%)
- Diameters of wafers: ☒6-76.2mm

Langasite crystal (La3Ga5SiO14, LGS), also called Lanthanum gallium silicate, belonging to the space group P321, point group 32, is a novel piezoelectric material with great potential for the fabrication of surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices.

The LGS crystal has a higher electromechanical coupling factor (15.8%) than that of a quartz crystal, and the value indicates the effectiveness with which a piezoelectric material converts electrical energies into mechanical energies. It is also worth noting that the propagation velocities of a surface acoustic wave in LGS crystal is much lower, this value determines the filter size. When manufacturing quartz and LGS filters operating at the same center frequency, the geometrical dimensions of LGS filters can be made smaller, which conforms with the trend of the dense integration of modern electronics and saves production cost. In addition, The devices made of langasite crystal could be used at high temperatures up to 900 ℃ because of its high thermal stability.

Hangzhou Shalom EO offers the LGS crystals blanks, polished substrates, and wafers upon customers' request.

LGS Crystals Blanks or Blocks:

X Direction	5~40mm	Y Direction	5~40mm
Z Direction	~80mm	Direction Precision	±20′

Langasite Slices:

Diameter	5~14mm	Frequency	2.7~21MHz
Direction Precision	±20′	Surface Roughness(Lapped)	Ra=0.3~0.5μm

Sensor, SAW Wafers:

Diameter	6~76.2mm	Thickness	0.13~0.5mm
Reference Flat	2~15mm	Surface Roughness (CMP single or double sides)	Ra≤1nm
Orientation	Following customer specifications		

Table 1. Basic Properties of Langasite

Constant	Relative Dielectric Constant		Piezoelectric Constant (pC/N)		Elastic Stiffness (1011Pa)					
	ε11	ε33	d11	d14	c11	c12	c13	c14	c33	c44
Value	18.96	50.19	5.66	-5.48	1.898	1.058	1.022	0.144	2.626	0.535
First Order Temp.Coef. (10-6.K-1)	150	-760	329	-342	-66	204	-75	-335	-94	-63

Table 2. Comparative Parameters of Piezoelectric Crystals

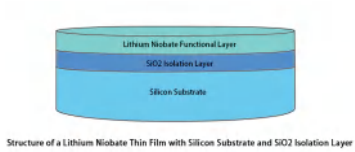
Crystals	Quartz SiO2	Langasite La3Ga5SiO14	Lithium tetraborate Li2B4O7	Lithium Tantalite LiTa3
Electromechanical Coupling Factor K%(BAW)	7.0	15.8	24.0	47.0
Frequency Spacing Δf, %	0.25	0.90	4.00	7.00
Q-Factor Q, x103	100	50	10	2
Temperature Frequency Coefficient TFC, x10-6/°C	0.5	1.6	6.0	4.0

Table 3 SAW Properties of Langasite and Quartz

Crystals	Quartz(SiO2)	Langasite(La3Ga5SiO14)
Density (g/cm3)	2.65	5.746
SAW Velocity Vef (m/s)	(0°,132.75 °,0 °)3157	(0°,140 °,25 °)2756
K2emc,%(SAW)	0.14	0.36
Second order temp.coef. α2(x10-8/°C2)	-3.2	-6.8
Temp. Coef. TTO(°C)	25	23
Dielectric Constant (ε)	4.92	27
Power flow angle Φ, °	0	0.5

LiNbO3- LNOI or Ultra-thin LiNbO3 film (300-900nm)





Structure of a Lithium Niobate Thin Film with Silicon Substrate and SiO2 Isolation Layer

- High electro-optical, nonlinear optical, electro-mechanical coefficients
- Diameters: 3", 4", 6", 8"
- Top functional layer ultra-thin thickness: 300-900nm
- Versions with optional SiO2 isolation layers and Si/LN/Quartz/Fused Silica substrates are available
- Applications: data centers, long-distance data transmission, mobile phones, base stations, etc.

Lithium Niobate on Insulator (LNOI) Lithium niobate on insulator (LNOI) is a promising platform for integrated photonics. It involves transferring thin films of lithium niobate onto insulating substrates, such as silicon dioxide or silicon nitride. This technique allows for the integration of lithium niobate-based devices, which are known for their excellent electro-optical, nonlinear-optical, and piezoelectric properties, with existing silicon photonics platforms.

Lithium Niobate is a versatile and excellent material with high nonlinearities and exclusive electro-optical, and piezoelectric properties. One significant advantage of LNOI is its high electro-optical coefficient, which enables efficient modulation of light signals with low power consumption. This trait is essential for developing high-speed optical modulators used in data communication devices. In addition, the nonlinear optical properties of lithium niobate allow for the generation of new frequencies through processes such as second-harmonic generation and parametric amplification. Thin Film LiNbO3 modulator reduces the detrimental free-carrier effect, delivering the advantages of compact size, broad bandwidth, high data transfer rates, compliance with CMOS voltage drivers, and low power consumption. LNOI Filters excel in wide bandwidth, high frequencies, and better thermal properties. LNOI is also an excellent technique to manufacture ultra-low loss resonators.

With the development of matured nanofabrication techniques, Shalom EO is capable of providing nano-scale 300-900nm Lithium Niobate On Insulator (LNOI). Our LiNbO3 on insulator consists of a top functional ultra-thin film of Lithium Niobate with a thickness range of 300-900nm, a supporting substrate made from Silicon/Quartz/Lithium Niobate/Fused Silica, and an optional SiO2 isolation layer. The LNOI features low insertion losses, reliable stabilities, and are exquisite when used to manufacture high-speed electro-optical modulators, and high-performance SAW filters, and are fit for application contexts such as data centers, long-distance data transmission, mobile phones, base stations, etc.

Specifications:

Layers	Parameter	Specifications			
Top Functional Layer	Material	Lithium Niobate			
	Diameter	3"	4"	6"	8"
	Surface Orientation	X-cut or according to request			
	Primary Flat Orientation	according to request			
	Secondary Flat Orientation	according to request			
	Film Thickness	300-600nm			
	Front Side Finish	Optical Polished			
Isolation Layer	Buried Oxide Avg. Thickness	4600nm	4700nm	4800nm	/
	Buried Oxide Thickness Uniformity	-5%	0%	5%	/
Support Substrate	Material	Si, Ln, Sapphire, Quartz, etc.			
	Diameter	3"	4"	6"	8"
	Thickness	0.525mm	0.525mm	0.675mm	0.725mm
	Growth Method	CZ	CZ	ZVD	Hydrothermal
	Orientation	{100}		0.5	deg.
	Dopant	Phos			
	Surface Finish			10	nm

Lithium Tantalate On Insulator (LTOI) 300-900nm



- Ultra-thin thickness 300-900nm LiTaO3 thin films constructed on silicon substrates
- Unique electro-optical, pyroelectric, piezoelectric, and properties
- Diameters: 3", 4", 6"(typical), or other custom diameters
- Orientations:Y-42, Y-46.3, Z, etc.
- Optional SiO2 isolation layers are available
- Applications: integrated photonic devices, high-performance RF filters, mobile phones, and wireless communication

Lithium Tantalate On Insulator (LTOI) represents a cutting-edge platform in the field of integrated photonics and electronics, offering a fusion of the unique properties of lithium tantalate (LiTaO3) with the scalabilities and compatibilities of insulating substrates.

Lithium tantalate (LiTaO3) is renowned for its exceptional nonlinear-optical, piezoelectric, and nonlinear optical properties. Its high electro-optic coefficient and nonlinearities facilitate efficient modulation of light signals. High damage thresholds and high photorefractive damage make LTOI a promising material platform for high-power and short-wavelength (down to the UV) integrated photonic devices. With excellent piezoelectric properties, LTOI can convert mechanical energies into electrical energies with high efficiencies, rendering them an attractive candidate for high-performance RF filters, mobile phones, and wireless communication.

Hangzhou Shalom EO offers custom Lithium Tantalate On Insulator (LTOI) consisting of a LiTaO3 thin film on a silicon substrate. Various cut directions are available, the thickness of the functional LiTaO3 layer is 300-900nm, and SiO2 insulation layers are optional.

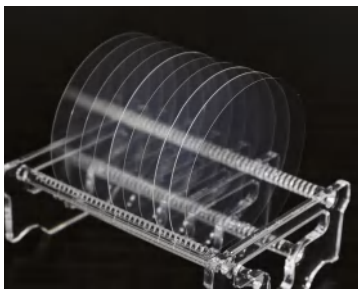
Specifications:

Top Functional Layer	
Diameter	3, 4, 6 inches, or other custom diameters
Orientation	Y-42, Y-46.3, Z, etc.
Material	LiTaO3
Thickness	300-900 nm
Isolation Layer	
Material	SiO2
Thickness	300-4000nm
Substrate	
Material	Si
Thickness	400-500μm

Modules or Types:

Single-crystal Lithium Tantalate Thin Film
SiO2
Silicon Substrates

20-100μm Ultra Thin LiTaO3 Wafers



- Ultra-thin free-standing wafers
- Dimensions: diameters: 3, 4 inches
- Thickness range: 20-100μm
- Orientations: X, Y, Z, etc.
- Material: LiTaO3
- Surface finish options: Single side or Double sides polished

Shalom EO offers custom 20-100μm ultra-thin LiTaO3 wafers, the wafers are available in free-standing versions without substrate. Our ultra-thin LiTaO3 wafers have versatile functions and are excellent when incorporated into pyroelectric gas detectors and pyroelectric flame detectors. The sensors based on these ultra-thin LiTaO3 wafers excel in high sensitivities.

Specifications:

Top Functional Layer	
Diameter	3, 4 inches
Orientation	X, Y, Z, etc.
Material	LiTaO3
Thickness	20-100μm
Surface	Single-side or double-side polished

5-50 μm LT, LN, Quartz on Silicon



- Dimensions: diameters: 3,4 inches, thicknesses: 5-50μm
- Orientations:X, Y-42, Y-46.3, Z, etc.
- Top functional layers made of LiTaO3, LiNbO3, Quartz available
- Silicon substrates with thicknesses of 230-500μm available

This catalog specifies Shalom EO's Lithium Niobate On Insulator (LNOI), Lithium Tantalate On Insulator (LTOI), and Quartz on Insulator consisting of LiNbO3, LiNbO3, or quartz thin films constructed on silicon substrates. The thickness range of the top functional thin film is 5μm-50μm, and the thickness range of the Si substrates is 230-500μm.

Specifications:

Top Functional Layer	
Diameter	3, 4, 6 inches
Orientation	X, Y-42, Y-46.3, Z, etc.
Material	LiTaO3, LiTaO3, Quartz, etc.
Thickness	5-50μm
Substrate	
Material	Si
Thickness	230-500μm

Modules or Types:

Single-crystal Lithium Tantalate Thin Film
Silicon Substrates

Single-crystal Lithium Niobate Thin Film
Silicon Substrates

Single-crystal Quartz Thin Film
Silicon Substrates

Customized Thin Films



- Various modules consisting of top functional thin films, substrates, and electrodes or single/multi-layer structures for choosing
- Thickness 0.1-50μm or customized
- The top layer is made of LTOI/ LNOI/Quartz
- Substrates made of SiO2, Si, Sapphire, Quartz, etc.
- Electrode layers made of Au, Pt, Cr, Al, etc.
- Doped with MgO, Fe, Er, Tm, etc.

Hangzhou Shalom EO provides a series of customized thin films including LiNbO3, LiTaO3, and Quartz thin films deposited on substrate materials including a diverse range: SiO2, Si, Sapphire, Quartz, etc., where multiple other parameters can be tailored upon request. We utilize the meticulous engineering of various electrodes/waveguides, periodical poling, doping, etc., and orientations to meet your specific requirements.

Modules or Types:

Customized Lithium Niobate, Lithium Tantalate & Quartz Thin Films							
Top Layer/ Details			Substrate Details		Top Layer Thin Film Details		
Top Layer/ Details	Multilayer Structure	Patterned Electrode & Waveguide	Different Material (SiO2, Si, Sapphire, Quartz etc.)	Special Size	Electrode(Au,Pt, Cr, Al, etc.)	Orientation (Same as Bulb Wafers)	Doped(MgO, Fe, Er, Tm, etc.)
100-1000 nm LiNbO3	√	√	√	√	√	√	√
100-1500 nm LiTaO3	√	√	√	√	√	√	√
5-50μm LiNbO3	√		√	√		√	
5-50μm LiTaO3	√		√	√		√	
5-50μm Quartz		√	√	√		√	

Optical Grade LiNbO3 Crystal Wafers



- High electro-optical and High nonlinear optical coefficients
- Diameter 2", 3", 4" or custom
- Minimum thickness: 0.05mm
- SAW Grade LiNbO3 Wafers are also available
- Crystal ingots, blanks, and customized wafers and substrates available
- Applications: Polarizers for Optic Isolators, Integrated Waveguides, EO Phase Modulators, Optical Modulator, Optical Isolators, Electro-optic Q-switches, fifth-generation wireless communication (5G), micro-nano photonics, integrated photonics, quantum optics

Optical grade lithium niobate (LiNbO3) wafers are wafers made of lithium niobate with little impurities and defects, which meets the critical requirements for optical applications. LinbO3 has many merits that make them outstanding as optical grade wafers, including high electro-optical and high nonlinear optical coefficients, a wide transmission wavelength range (0.3 - 5 μm), a high index of refraction, and reliable chemical and mechanical stabilities. These traits permit the efficient and precise control of light.

Hangzhou Shalom EO offers optical grade lithium niobate (LiNbO3) crystal ingots, blanks, wafers, and substrates, both off-the-shelf and custom products are available. Advanced facilities are equipped for crystal growing, wafer cutting, lapping, and polishing. Before shipping, a stringent testing process is taken under our ISO9001-certified QC system. Shalom EO also provides a variety of LiNbO3 crystal-based products, including SAW LiNbO3 wafers and substrates, MgO doped LiNbO3 crystals and wafers, Periodically poled lithium niobate (PPLN), LiNbO3 crystal for EO Phase Modulators, Optical Modulator applications, and Lithium Niobate Electro-optical (EO) pockels cells.

Common Specifications:

Material	Optical regular and optical super Grade LiNbO3	
Curie Temp	1142±2.0℃	
Cutting Angle	X/Y/Z etc	
Diameter/Size	2"/3"/4"	
Tol(±)	<0.20 mm	
Thickness	0.18 ~ 1.0mm or more	
Primary Flat	16mm/22mm /32mm	
Orientation Flat	All available	
Surface Type	Single Side Polished /Double Sides Polished	
Polished side Ra	<0.5nm	
Surface Quality	20/10 S/D	
Edge Criteria	R=0.2mm or Bullnose	
Wafer Surface Criteria	Refractive index	No=2.2878/Ne=2.2033 @632nm wavelength
	Contamination	None
	Particles ℄ >0.3 μm	<= 30
	Scratch , Chipping	None
	Defect	No edge cracks, scratches, saw marks, stains

Product List of Optical Grade LiNbO3 Crystal Wafers

Code	Material	Diameter	Thickness	Orientation	Surface Finish	Unit Price
631-001	Optical Grade LiNbO3	Φ76.2mm	0.35mm	X-cut	DSP	Inquire
631-002	Optical Grade LiNbO3	Φ76.2mm	0.35mm	Z-cut	DSP	Inquire
631-003	Optical Grade LiNbO3	Φ76.2mm	0.5mm	X-cut	DSP	Inquire
631-004	Optical Grade LiNbO3	Φ76.2mm	0.5mm	Z-cut	DSP	Inquire
631-005	Optical Grade LiNbO3	Φ100mm	0.35mm	X-cut	DSP	Inquire
631-006	Optical Grade LiNbO3	Φ100mm	0.35mm	Z-cut	DSP	Inquire
631-007	Optical Grade LiNbO3	Φ100mm	0.5mm	X-cut	DSP	Inquire
631-008	Optical Grade LiNbO3	Φ100mm	0.5mm	Z-cut	DSP	Inquire
631-009	Optical Grade LiNbO3	Φ100mm	1.0mm	X-cut	DSP	Inquire
631-010	Optical Grade LiNbO3	Φ100mm	1.0mm	Y-cut	DSP	Inquire
631-011	Optical Grade LiNbO3	Φ100mm	1.0mm	Z-cut	DSP	Inquire

SAW Grade LiNbO3 Wafers



- Diameters: 2.5", 3", 4" and 6"
- Orientations: X, Y, Z, Y36, Y41, Y45, Y64, Y128, Y135
- Crystal ingots, blanks, and customized wafers available
- Curie Temperature and QC Tested
- Optimized for surfaced acoustic wave (SAW) devices
- Optical Grade LiNbO3 Crystal Wafers, MgO:LiNbO3 crystals for EO application, Nonlinear LiNbO3 and MgO:LiNbO3, and MgO:PPLN Crystals are also available

Lithium niobate crystal, referred to as LN, belongs to the trigonal crystal system with a distorted perovskite-type structure. The LiNbO3 crystal exhibits manifold useful properties, including piezoelectric, ferroelectric, photoelectric, nonlinear optical, thermoelectric, etc. SAW grade LN wafers are wafers assigned to usages for Surface Acoustic Wave (SAW) devices, which convert acoustic waves to electrical signals by exploiting the piezoelectric effect of the materials. Compared with the normal lithium niobate, the saw grade niobate could be discriminated by higher near ultra-violet absorption and lower pyroelectric charge attributed to higher electrical conductivities. As a SAW-grade material, the competitiveness of LiNbO3 is composed of high electromechanical coupling factors and low insertion loss, which allow the LN wafer to transform the energies with high efficiencies.

Hangzhou Shalom EO offers the SAW grade lithium niobate (or LiNbO3) crystals and wafers, advanced facilities are equipped, and cutting-edge techniques are utilized for crystal growth, wafer cutting, wafer lapping, wafer polishing and wafer checking, all finished products pass Curie Temp testing and stringent QC inspections. Our LiNbO3 Wafers could be integrated into various SAW devices such as resonators, filters, and delay lines with excellent fitness. SAW grade or acoustical grade LiNbO3 crystals are available in the form of boules or ingots, blanks, wafer blanks, and polished wafers. Optical Grade LiNbO3 Crystal Wafers, MgO:LiNbO3 crystals for EO application, Nonlinear LiNbO3 and MgO:LiNbO3, and MgO:PPLN Crystals are also available.

LiNbO3 Crystal Specifications:

Crystals Orientations	X,Y,Z, Y36, Y41,Y49, Y64,Y128, Y135	Orientation Fluctuation	±0.30°
Diameter	2.5", 3", 4" and 6", or customized	Length	50~100mm
Curie Temp	1142±3°C	Orientation of First Reference Flat	As required ±0.2 0
Length of First Reference Flat	32±2 mm (4 "),22±2 mm (3 ") inspection polished.	Second Reference Flat	Available if required, the length shall be 12±3 mm (4 "),10±3mm(3 ")
Appearance	Free of crack, pore, inclusion		

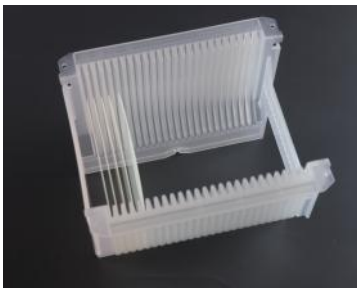
Specifications for 3"/4"/5"/6" LN Wafers

Specifications for 3"/4"/5"/6" LN wafers				
Wafer Size	3"	4"	5"	6"
Diameter(mm)	76.2	100	125	150
Tolerance (±mm)	0.25	0.5	0.5	0.5
Primary Reference Flat (mm)	22mm or customized	32.5mm or customized	42.5mm or customized	57.5mm or customized
Cutting Angle	X,Y,Z, Y36, Y41,Y64,Y49,Y128, Y135			
Orientation Flat	All available			
Surface Type	Single side polished/Double sides polished			
Polished Side Ra (nm)	≤1			
Back Side Criteria (μm)	General is 0.2-0.5 or as customized			
Edge Rounding	Compliant with SEMI M1.2 Standard/refer to IEC62276			
Appearance	Contamination: None			
	Particles Φ>0.3μm: ≤30			
	Saw Marks, striations: None			
	Scratch: None			
	Cracks, crowsfeet, Saw marks, strains: None			

Product List of SAW Grade LiNbO3 Wafers

Code	Material	Diameter	Thickness	Orientation	Surface Finish	Unit Price
611-001	SAW LiNbO3	Φ76.2mm	0.35mm	Y36-cut	SSP	Inquire
611-002	SAW LiNbO3	Φ76.2mm	0.35mm	Y128-cut	SSP	Inquire
611-003	SAW LiNbO3	Φ76.2mm	0.35mm	Y36-cut	DSP	Inquire
611-004	SAW LiNbO3	Φ76.2mm	0.35mm	Y128-cut	DSP	Inquire
611-005	SAW LiNbO3	Φ76.2mm	0.35mm	Y-cut	SSP	Inquire
611-006	SAW LiNbO3	Φ76.2mm	0.35mm	Y-cut	DSP	Inquire
611-007	SAW LiNbO3	Φ76.2mm	0.5mm	Y36-cut	SSP	Inquire
611-008	SAW LiNbO3	Φ76.2mm	0.5mm	Y128-cut	SSP	Inquire
611-009	SAW LiNbO3	Φ76.2mm	0.5mm	Y36-cut	DSP	Inquire
611-010	SAW LiNbO3	Φ76.2mm	0.5mm	Y128-cut	DSP	Inquire
611-011	SAW LiNbO3	Φ76.2mm	0.5mm	Y-cut	SSP	Inquire
611-012	SAW LiNbO3	Φ76.2mm	0.5mm	Y-cut	DSP	Inquire
611-013	SAW LiNbO3	Φ100mm	0.35mm	Y36-cut	SSP	Inquire
611-014	SAW LiNbO3	Φ100mm	0.35mm	Y128-cut	SSP	Inquire
611-015	SAW LiNbO3	Φ100mm	0.35mm	Y36-cut	DSP	Inquire
611-016	SAW LiNbO3	Φ100mm	0.35mm	Y128-cut	DSP	Inquire
611-017	SAW LiNbO3	Φ100mm	0.35mm	Y-cut	SSP	Inquire
611-018	SAW LiNbO3	Φ100mm	0.35mm	Y-cut	DSP	Inquire
611-019	SAW LiNbO3	Φ100mm	0.5mm	Y36-cut	SSP	Inquire
611-020	SAW LiNbO3	Φ100mm	0.5mm	Y128-cut	SSP	Inquire
611-021	SAW LiNbO3	Φ100mm	0.5mm	Y36-cut	DSP	Inquire
611-022	SAW LiNbO3	Φ100mm	0.5mm	Y128-cut	DSP	Inquire
611-023	SAW LiNbO3	Φ100mm	0.5mm	Y-cut	SSP	Inquire
611-024	SAW LiNbO3	Φ100mm	0.5mm	Y-cut	DSP	Inquire
611-025	SAW LiNbO3	Φ150mm	0.5mm	Y128-cut	SSP	Inquire
611-026	SAW LiNbO3	Φ150mm	0.5mm	Y128-cut	DSP	Inquire
611-027	SAW LiNbO3	Φ150mm	0.5mm	Y-cut	SSP	Inquire
611-028	SAW LiNbO3	Φ150mm	0.5mm	Y-cut	DSP	Inquire
611-029	SAW LiNbO3	Φ150mm	1.0mm	X-cut	DSP	Inquire
611-030	SAW LiNbO3	Φ150mm	1.0mm	Y-cut	DSP	Inquire
611-031	SAW LiNbO3	Φ150mm	1.0mm	Z-cut	DSP	Inquire

Optical Grade LiTaO3 Crystal Wafers



- Diameter: 2", 3"
- Minimum thickness: 0.05mm
- Crystals ingots, blanks, wafers, substrates available
- No surface defects (no edge cracks, scratches, saw marks, stains)
- Applications: electro-optical modulator, optical fiber communications applications

Lithium Tantalate (LiTaO3), referred to as LT, is a crystal with a perovskite structure. LiTaO3 exhibits distinguished optical, piezoelectric, and pyroelectric properties. For different applications, the critical parameters of LiTaO3 differ. Optical grade LiTaO3 crystal wafers boast a unique set of properties that make them ideal for optical applications. Optical grade LiTaO3 exhibits high optical transmission across a broad spectrum, spanning from ultraviolet to near-infrared wavelengths. The strong electro-optic effect of LiTaO3 allows for efficient modulation of light with low drive voltages, enabling the manipulation and modulation of optical signals for data communication and signal processing. In addition, LT possesses consistent optical characteristics throughout its volume and low optical absorption, facilitating efficient light transmission with minimum distortions, aberrations, or other undesirable effects.

Hangzhou Shalom EO offers optical grade lithium tantalate (LiTaO3) crystal ingots, blanks, wafers, and substrates, both off-the-shelf and custom products are available. Advanced facilities are equipped for crystal growing, wafer cutting, lapping, and polishing. Before shipping, a stringent testing process is taken under our ISO9001-certified QC system.

Specifications:

Material	Optical Grade LiTaO3	
Curie Temp	603±2℃	
Cutting Angle	X/Y/Z etc	
Diameter/Size	2"/3"/4"	
Tol(±)	<0.20 mm	
Thickness	0.18 ~ 1.0mm or more	
Primary Flat	16mm/22mm /32mm	
Orientation Flat	All available	
Surface Type	Single Side Polished /Double Sides Polished	
Polished Side Ra	<0.5nm	
Back Side Criteria	General 0.2-0.5μm or as customized	
Surface Quality	20/10 S/D	
Edge Criteria	R=0.2mm or Bullnose	
Wafer Surface Criteria	Contamination	None
	Particles ∅ >0.3 μm	<= 30
	Scratch , Chipping	None
	Defects	No edge cracks, scratches, saw marks, stains

Product List of Optical Grade LiTaO3 Crystal Wafers

Code	Material	Diameter	Thickness	Orientation	Surface Finish	Unit Price
632-001	Optical LiTaO3	Φ76.2mm	0.35mm	X-cut	DSP	Inquire
632-002	Optical LiTaO3	Φ76.2mm	0.35mm	Z-cut	DSP	Inquire
632-003	Optical LiTaO3	Φ76.2mm	0.5mm	X-cut	DSP	Inquire
632-004	Optical LiTaO3	Φ76.2mm	0.5mm	Z-cut	DSP	Inquire
632-005	Optical LiTaO3	Φ100mm	0.35mm	X-cut	DSP	Inquire
632-006	Optical LiTaO3	Φ100mm	0.35mm	Z-cut	DSP	Inquire
632-007	Optical LiTaO3	Φ100mm	0.5mm	X-cut	DSP	Inquire
632-008	Optical LiTaO3	Φ100mm	0.5mm	Z-cut	DSP	Inquire

SAW Grade LiTaO3 Wafers



- Unique piezoelectric properties
- Diameters: 2", 3", 4", and 6"
- Orientations: Y, Y36 ,Y42, Y48, Y128, X-112Y
- Crystal ingots, blanks, polished wafers, and customized wafers available
- Curie Temp and QC Tested
- Applications: surfaced acoustic wave (SAW) devices

Lithium tantalate (LiTaO3), referred to as LT, belongs to the trigonal system, with a distorted perovskite structure and point group c63vr3c.

SAW Grade Lithium tantalate is optimized for Surface Acoustic Wave (SAW) uses with exceptional piezoelectric properties, allowing efficient transferring of mechanical signals into electrical signals. Polished LT wafers are often used for manufacturing a diverse range of SAW devices resonators, filters, transducers, and other electronic communication devices, attributed to their good mechanical and electrical coupling, temperature coefficient, and other comprehensive performance. SAW grade LT finds prominence in fabricating high-frequency surface acoustic wave devices and multiple high-end communication fields such as mobile phones, walkie-talkies, satellite communications, aerospace, and so on.

Hangzhou Shalom EO offers SAW-grade lithium Tantalate (or LiTaO3) crystals and wafers, advanced facilities are equipped for crystal growing, wafer cutting, wafer lapping, wafer polishing, and wafer checking, and all finished products will undergo Curie Temp testing and QC inspections. The SAW grade LiTaO3 crystals are available in various forms including boules, blanks, wafer blanks, and polished wafers.

Specifications:

Crystals Orientations	X,Y,Z, Y36, Y42,Y48, X-112Y	Orientation Fluctuation	±0.30°
Diameter	2", 3", 4", 6" and customized	Length	50~80mm
Curie Temp	605±3°C	Orientation of First Reference Flat	As required ±0.2 0
Length of First Reference Flat	32±2 mm (4 "), 22±2 mm (3 ") inspection polished	Second Reference Flat	Available if required, the length shall be 12±3 mm (4 "), 10±3mm(3 ")
Appearance	Free of crack, pore, inclusion		

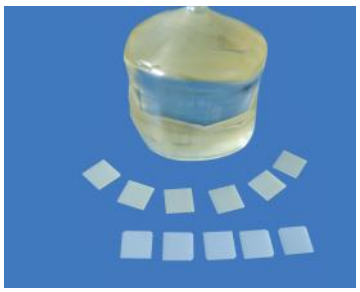
Specifications for 3"/4" LT Wafers

Wafer Size	3"	4"	6"
Diameter(mm)	76.2mm	100mm	150mm
Tolerance (±mm)	0.25	0.5	0.5
Primary Reference Flat (mm)	22mm or customized	32.5mm or customized	57.5mm or customized
Cutting Angle	X,Y,Z, Y36, Y42,Y48,X-112Y etc.		
Orientation Flat	All available		
Surface Type	Single side polished/Double sides polished		
Polished Side Ra (nm)	≤1		
Back Side Criteria (μm)	General is 0.2-0.5 or as customized		
Edge Rounding	Compliant with SEMI M1.2 Standard/refer to IEC62276		
Appearance	Contamination: None		
	Particles Φ>0.3μm: ≤30		
	Saw Marks, striations: None		
	Scratches: None		
	Cracks, crowsfeet, Saw marks, strains: None		

Product List of SAW Grade LiTaO3 Wafers

Code	Material	Diameter	Thickness	Orientation	Surface Finish	Unit Price
612-001	SAW LiTaO3	Φ76.2mm	0.35mm	Y42-cut	SSP	Inquire
612-002	SAW LiTaO3	Φ76.2mm	0.35mm	X112-Y	SSP	Inquire
612-003	SAW LiTaO3	Φ76.2mm	0.35mm	Y42-cut	DSP	Inquire
612-004	SAW LiTaO3	Φ76.2mm	0.35mm	X112-Y	DSP	Inquire
612-005	SAW LiTaO3	Φ76.2mm	0.5mm	Y42-cut	SSP	Inquire
612-006	SAW LiTaO3	Φ76.2mm	0.5mm	X112-Y	SSP	Inquire
612-007	SAW LiTaO3	Φ76.2mm	0.5mm	Y42-cut	DSP	Inquire
612-008	SAW LiTaO3	Φ76.2mm	0.5mm	X112-Y	DSP	Inquire
612-009	SAW LiTaO3	Φ100mm	0.35mm	Y42-cut	SSP	Inquire
612-010	SAW LiTaO3	Φ100mm	0.35mm	X112-Y	SSP	Inquire
612-011	SAW LiTaO3	Φ100mm	0.35mm	Y42-cut	DSP	Inquire
612-012	SAW LiTaO3	Φ100mm	0.35mm	X112-Y	DSP	Inquire
612-013	SAW LiTaO3	Φ100mm	0.5mm	Y42-cut	SSP	Inquire
612-014	SAW LiTaO3	Φ100mm	0.5mm	X112-Y	SSP	Inquire
612-015	SAW LiTaO3	Φ100mm	0.5mm	Y42-cut	DSP	Inquire
612-016	SAW LiTaO3	Φ100mm	0.5mm	X112-Y	DSP	Inquire

LSAT Substrates



- Maximum diameter: 2 inches, typical thickness 0.5/1.0mm
- Orientations of LSAT substrates:＜100＞,＜110＞,＜111＞
- Stock and custom LSAT substrates available
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Applications: for epitaxial thin film growth in ferroelectric and high temperature superconductor (HTS) devices

LSAT - Lanthanum Strontium Aluminum Tantalum Oxide or (La,Sr)(Al,Ta)O3, abbreviated as LSAT, is a crystal with a mixed perovskite structure. LSAT is a hard, transparent oxide composed of the elements lanthanum, aluminum, strontium, and tantalum. LSAT substrates are widely used for epitaxial growth of ferroelectric and high temperature superconductor (HTS) thin films, and in particular popular for epitaxial oxides and their heterostructures, often for the researching purpose of electron correlation phenomena. Typical materials grown on LSAT substrates include strontium titanate (SrTiO3), cuprate superconductors (such as YBCO), iron-based superconductors (iron-pnictides), rare-earth manganites, rare-earth nickelates, and others. Semiconductors such as gallium nitride can also be grown on LSAT.

Common Specifications:

Material	LSAT crystals	Orientation	＜100＞, ＜110＞, ＜111＞
Orientation Error	±0.5°	Maximum Diameter	2 inches
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	Ra<0.5nm	Cleanness and Package	class 1000 clean room and class 100 bags

Basic Properties:

Growth Method	Czochralski method	Crystal Structure	M3
Unit Cell Constant	a=3.868 Å	Melt Point（℃）	1840
Density	6.74（g/cm3）	Hardness	6.5（mohs）
Dielectric Constants	22	Thermal Expansion	10 x 10-6 /K

Product List of LSAT Substrates

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
643-001	5x5mm	0.5mm	<100>	SSP	Inquire
643-002	5x5mm	0.5mm	<100>	DSP	Inquire
643-003	5x5mm	0.5mm	<110>	SSP	Inquire
643-004	5x5mm	0.5mm	<111>	SSP	Inquire
643-005	10x10mm	0.5mm	<100>	SSP	Inquire
643-006	10x10mm	0.5mm	<100>	DSP	Inquire
643-007	10x10mm	0.5mm	<110>	SSP	Inquire
643-008	10x10mm	0.5mm	<111>	SSP	Inquire
643-009	Φ12.7mm	0.5mm	<100>	SSP	Inquire
643-010	Φ12.7mm	0.5mm	<100>	DSP	Inquire
643-011	Φ25.4mm	0.5mm	<100>	SSP	Inquire
643-012	Φ25.4mm	0.5mm	<100>	DSP	Inquire
643-013	Φ50.8mm	0.5mm	<100>	SSP	Inquire
643-014	Φ50.8mm	0.5mm	<100>	DSP	Inquire

Magnesium Aluminate (MgAlO4) Substrates



- Stocked and custom MaAl2O4 (or Spinel) Substrates available
- Maximum diameter: 2 inches, typical thickness 0.5/1.0mm
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Orientation of MgAl2O4 substrates:＜100＞,＜110＞,＜111＞
- Applications: ferroelectric/HTSC thin film growth, epitaxial thin film growth of high-quality GaN films, III-V nitrides thin film growth, bulk acoustic wave and microwave devices

Magnesium Aluminate (MgAl2O4) single crystals, also known as spinels, possess a cubic crystal structure and exhibit excellent mechanical, thermal, and chemical stabilities. MgAl2O4 substrates exhibit optical transmittance over a wide spectral range, from UV to IR, along with low dielectric loss, making them suitable for optical and photonic applications. MgAl2O4 finds widespread usage in bulk acoustic wave and microwave devices and is an excellent substrate material for fast epitaxial growth of III-V nitrides in IC with moderate cost. MgAl2O4 is cleaved on the (100) plane, therefore GaN LD cavities can be obtained by cleaving MgAl2O4 substrates along the (100) direction, which will also work well for ZnO.

Hangzhou Shalom EO provides stock epi-ready MgAl2O4 wafers and custom MgAl2O4 wafers.

Specifications:

Material	MgAl2O4 crystals	Orientation	＜100＞, ＜110＞, ＜111＞
Orientation Error	±0.5°	Maximum Diameter	20mm
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	Ra<0.5nm	Cleanness and Package	class 1000 clean room and class 100 bags

Physical Properties:

Crystal Structure	Cubic: a = 8.083 Å	Growth Method	Czochralski
Density	3.64 g/cm3	Melt Point	2130℃
Hardness	8.0 (Mohns)	Thermal Expansion	7.45 (x10-6/℃)
Phase Velocity	6500 m/s at (100> shear wave)	Propagation Loss	6.5 dB/ms
Typical Growth Direction	<100> and <110>	Color	Colorless
Dielectric Constant	8-9		

Product List of MgAl2O4 Substrates

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
644-001	5x5mm	0.5mm	<100>	SSP	Inquire
644-002	5x5mm	0.5mm	<100>	DSP	Inquire
644-003	5x5mm	0.5mm	<110>	SSP	Inquire
644-004	5x5mm	0.5mm	<111>	SSP	Inquire
644-005	10x10mm	0.5mm	<100>	SSP	Inquire
644-006	10x10mm	0.5mm	<100>	DSP	Inquire
644-007	10x10mm	0.5mm	<110>	SSP	Inquire
644-008	10x10mm	0.5mm	<111>	SSP	Inquire
644-009	Φ12.7mm	0.5mm	<100>	SSP	Inquire
644-010	Φ12.7mm	0.5mm	<100>	DSP	Inquire
644-011	Φ25.4mm	0.5mm	<100>	SSP	Inquire
644-012	Φ25.4mm	0.5mm	<100>	DSP	Inquire
644-013	Φ50.8mm	0.5mm	<100>	SSP	Inquire
644-014	Φ50.8mm	0.5mm	<100>	DSP	Inquire

Magnesium Oxide (MgO) Substrates



- Twinless crystal structure, low dielectric constant (9.65), and miniature loss at microwave band
- Maximum Size: 50x50x30mm
- Stocked and custom MgO substrates available
- Orientations:＜100＞,＜110＞ and ＜111＞
- Surface Roughness: Ra < 0.5nm
- Applications: Thin film growth of Ferro-magnetic, Photo-electronic, semiconductor, and high-temperature superconductor (HTSC) applications

MgO (Magnesium Oxide Crystals), due to its low dielectric constant and minimal microwave band loss, along with the availability of large-sized wafers (up to 2 inches in diameter and larger), has emerged as a crucial industrial material for High-Temperature Superconductor (HTS) thin monocrystalline wafers. MgO serves as an exceptional single-crystal substrate catering to various thin film growth tasks including Ferro-magnetic, Photo-electronic, semiconductor, and high-temperature superconductor films. Its utility extends to III to V element research, exploring epitaxial effects on polymer crystallization, and even for depositing ferroelectric coatings on its substrates. Moreover, MgO wafers find increasing applications in Plasma Display Panel (PDP) technology.

Hangzhou Shalom EO provides both stocked standard MgO wafers and custom MgO wafers.

Common Specifications:

Material	MgO crystals	Orientation	＜100＞, ＜110＞, ＜111＞
Orientation Error	±0.5°	Maximum Size	50x50mm
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	Ra<0.5nm	Cleanness and Package	class 1000 clean room and class 100 bags

Basic Properties:

Growth Method	Special Arc Melting	Crystallographic Structure	Cubic a = 4.13 Å
Twinning Structure	Twin free	Orientation	<100>, <110>, <111>
Colour	Colourless	Transmission Range	0.2 to 8 μm
Density	3. 585 g/cm3	Melting Point	2780 +/- 20 °C
Thermal Expansion Coefficient	11.2 * 10-6 K-1	Dielectric Constant	9.65
Specific Resistivity	> 1017Ohm/cm		

Product List of MgO Substrates

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
641-001	5x5mm	0.5mm	<100>	SSP	Inquire
641-002	5x5mm	0.5mm	<100>	DSP	Inquire
641-003	5x5mm	0.5mm	<110>	SSP	Inquire
641-004	5x5mm	0.5mm	<111>	SSP	Inquire
641-005	10x10mm	0.5mm	<100>	SSP	Inquire
641-006	10x10mm	0.5mm	<100>	DSP	Inquire
641-007	10x10mm	0.5mm	<110>	SSP	Inquire
641-008	10x10mm	0.5mm	<111>	SSP	Inquire
641-009	Φ12.7mm	0.5mm	<100>	SSP	Inquire
641-010	Φ12.7mm	0.5mm	<100>	DSP	Inquire
641-011	Φ25.4mm	0.5mm	<100>	SSP	Inquire
641-012	Φ25.4mm	0.5mm	<100>	DSP	Inquire
641-013	Φ50.8mm	0.5mm	<100>	SSP	Inquire
641-014	Φ50.8mm	0.5mm	<100>	DSP	Inquire

Substituted GGG (SGG) Single Crystals and Wafers



- Low optical losses (<0.1%/cm) and fine chemical and mechanical properties
- High thermal conductivity (7.4W m-1 K-1) and High laser damage threshold (>1GW/cm2)
- Maximum diameter: 4 inches; typical thickness 0.5/1.0mm
- Clean package: class 1000 clean room and class 100 bags
- Typical orientation of SGGG substrates: ＜111＞
- Applications: liquid phase epitaxy (LPE), magneto-optical film, YIG& BIG film epitaxial growth

GGG, SGGG, and NGG Garnets are used as substrates for liquid phase epitaxy (LPE). GGG substrates are substrates oriented for growing magneto-optical film. GGG substrates are often used to grow the YIG or BIG film placed in a magnetic field, which is an indispensable part of an infrared isolator operating within the 1.3-1.5μm range utilized for optical communication. GGG single crystal substrates of different tangential can achieve the best lattice match with the magneto-optical material, thus ensuring the YIG and BIG film epitaxial growth is successful. SGGG Single-crystal is excellent for growing bismuth-substituted iron garnet epitaxial films.

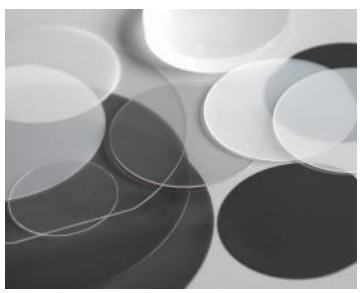
Specifications:

Material	SGGG single crystals	Orientation	＜111＞
Orientation Error	±0.2°	Maximum Diameter	4 inches
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	≤1nm	Cleanness and Package	class 1000 clean room and class 100 bags

Material Properties:

Material	SGGG	Chemical Formula	/
Lattice Constant	12.497Å	Growth Method	Czochralski
Density	7.09g/cm3	Mohs Hardness	7.5
Melting Point	1730℃	Refractive Index	1.954@1064nm

SAW Quartz (SiO2) Crystals and Wafers



- Diameters: 3", 4", 5" and 6"
- Crystal ingots, blanks, and customized wafers available
- Surface type: single-side polished/double sides polished
- Curie Temperature and QC Tested
- Applications: fabrication of piezoelectric devices for such as timing frequency control and frequency selection

Quartz crystal, chemical composition SiO2, and alpha quartz are the main ones used for SAW devices. Its melting point is 1750℃. The density is 2.65×103 kg/m3, and the Mohs hardness is 7. SAW-grade Quartz crystal wafers are favorable for Surface Acoustic Wave (SAW) application with remarkable piezoelectric properties. The thermal stability of quartz crystal is one of its most appealing attributes, its piezoelectric coefficient and dielectric coefficient remain almost unchanged at room temperature. In addition, other advantages of quartz crystal include high mechanical strength and quality factor, high rigidity, good dynamic characteristics, no pyroelectric and ferroelectric effect, good insulation, etc.

Quartz crystals are the most representative and common piezoelectric crystals among single crystals. The applications of piezoelectric quartz include resonators, high-frequency oscillators, and filters, and is widely integrated into navigation, remote control, telemetry, electronics, and electric equipment for automatic weapons, supersonic aircraft, missiles, nuclear weapons, electron microscopes, chronographs, etc.

Hangzhou Shalom EO offers Custom SAW grade quartz crystals and wafers, advanced facilities are equipped for crystal growth, wafer cutting, wafer

lapping, wafer polishing, and wafer checking, and all finished products undergo Curie Temp testing and QC inspections. Quartz crystal ingots, crystal blanks, wafer blanks, and polished wafers are available upon customers' request.

Quartz Crystal Specifications:

Materials	both Pure Z and Y bar available	Synthetic Q Value	min 1.8 , 2.4 to 3.0 mil IEC
Etch Channel Density	max 15/cm2 max100/cm2; max300/cm2	Stress	No dark or discolored visible in polarized light
Surface Finishing	#1000, #2000, #3000 , #4000, and Polished std	Angle Tolerance	ZZ': +/-15" +/-30", +/-1' +/-2'
XX'	+/-15 , +/-30'	Cut Type	AT. BT. IT ,SC,....,etc.
Frequency	1Mhz up to 50 Mhz for AT-fundamental	Size for Round Blank	from 3.0 to 15.0 mm dia (with flat)
Size for Wafer	2.0x8.0 (mm)~ 16x16(mm)	SMD Type	2.5x3.0 above at Customer option
Flat	as requested the flat shall be perpendicular to X axis within +/- 10 deg		

Specifications for 3"/4"/5"/6" Quartz Wafers

Specifications for 3"/4"/5"/6" Quartz Wafers				
Wafer Size	3"	4"	5"	6"
Diameter(mm)	76.2	100	125	150
Tolerance (±mm)	0.25	0.5	0.5	0.5
Primary Reference Flat (mm)	22mm or customized	32.5mm or customized	42.5mm or customized	57.5mm or customized
LTV (5x5mm) (μm)	<2	<2	<2	<2
TTV (μm)	<8	<10	<15	<20
Bow (μm)	±20	±25	±40	±40
Warp(μm)	≤30	≤40	≤50	≤50
PLTV (%) (5x5mm)	≥90%	≥90%	≥90%	≥90%
Cutting Angle	AT36/ST42.75/X/Y/Z etc			
Orientation Flat	All available			
Surface Type	Single side polished/Double sides polished			
Polished Side Ra (nm)	≤1			
Back Side Criteria (μm)	General is 0.2-0.5 or as customized			
Edge Rounding	Compliant with SEMI M1.2 Standard/refer to IEC62276			
Appearance	Contamination: None			
	Particles Φ>0.3μm: ≤30			
	Saw Marks, striations: None			
	Scratch: None			
	Cracks, crowsfeet, Saw marks, strains: None			

Basic Properties:

1. Physical Properties of Synthetic Crystal Quartz

Density(g/cm3)	2.65	Melting Point(°C)	1467
Thermal Conductivity, W/(m x K) (T = 25°C)	10.7 (parallel to axis Z) 6.2 (perpendicular to axis Z)	Thermal Conductivity, W/(m x K) (T = 25°C)	7.1 ő 10-6 (parallel to axis Z) 13.2 ő 10-6 (perpendicular to axis Z)
Hardness (Mohs)	7	Specific Heat Capacity, J/(kg x K) (T = 25°C)	710
Specific Heat Capacity, J/(kg x K) (T = 25°C)	4.34 (parallel to axis Z) 4.27 (perpendicular to axis Z)	Young's Modulus (E), GPa	4.34 (parallel to axis Z) 4.27 (perpendicular to axis Z)
Shear Modulus (G), GPa	31.14	Bulk Modulus (K), GPa	36.4
Chemical Stability	insoluble in water	Elastic Coefficients	C11=87 C12=7 C44=58 C13=13 C14=18 C33=106

2. Synthetic Crystal Quartz Refractive Index vs Wavelength

Synthetic Crystal Quartz Refractive Index vs Wavelength								
λ(μm)	n0	ne	λ(μm)	n0	ne	λ(μm)	n0	ne
0.185	1.676	1.690	0.243	1.605	1.617	0.589	1.544	1.553
0.194	1.660	1.673	0.263	1.593	1.604	1.083	1.534	1.543
0.204	1.643	1.656	0.291	1.581	1.591	1.800	1.524	1.532
0.219	1.625	1.637	0.340	1.567	1.577	2.500	1.512	1.520
0.231	1.614	1.626	0.405	1.557	1.567	3.000	1.500	1.507

Silicon (Si) Crystals and Wafers



- High-purity silicon crystals and wafers for semiconductor
- Diameters: 2", 3", 4", 6" and 8" or customized size
- Stocked and custom Si wafers
- Applications: substrates for epitaxial film growth of GaN, semiconductors, electronics, lasers, solar cells, etc.

Semiconductor silicon wafers are often made of high-purity polycrystalline silicon ingots using the CZ Method to grow silicon single-crystal ingots with different resistivities or using the Float Zone method. The Si wafers are manufactured in a controlled and organized manufacturing process that follows: crystal growth, slicing, chamfering/grinding (lapping), surface etching/polishing, cleaning, inspection, packaging, and other processes.

Doping with designed concentrations can be introduced into the silicon crystal lattice to alter its electrical properties and create regions with specific conductivity (n-type or p-type) required for semiconductor devices. Si wafers are also excellent platforms for the deposition of various thin films to achieve specific functions.

Hangzhou Shalom EO offers various grades of Silicon (Si) wafers and substrates, they are used as substrates for GaN (Gallium Nitride) epitaxial film growth, semiconductors, and solar cells.

Specifications:

Orientation	<100>, <110>, <111>	Size(mm)	10×3, 10×5, 10×10, 15×15, 20×15
Thickness	0.5mm, 1.0mm	Size Tolerance	<±0.1mm
Thickness Tolerance	<±0.015mm(special in<±0.005mm)	Polishing	SSP (single surface polished) or DSP (double surface polished)
Redirection Precision	±0.5°	Redirection the Edge	2°(special in 1°)

Basic Properties:

Crystal Structure	M3	Melt Point(℃)	1420
Density(g/cm3)	2.4		
Doping Material	No	b-doped	p-doped
Type	I	P	N
Resistivity	>1000Ωcm	10-3~104Ωcm	10-3~104Ωcm
EPD	≤100/cm2	≤100/cm2	≤100/cm2
O Content (/cm3)	≤1~1.8×1018	≤1~1.8×1018	≤1~1.8×1018
C Content (/cm3)	≤5×1016	≤5×1016	≤5×1016

Silicon Carbide (SiC) Crystals and Wafers



- Wide band gap, several times wider than Silicon
- High thermal conduction and low thermal expansion
- High electric field breakdown voltage and high maximum current density
- Applications: High-frequency power electronic devices, LED solid-state lighting in harsh environments

Silicon Carbide (SiC) single crystal is a semiconductor with the chemical composition of silicon and carbon. Its remarkable thermal conduction, superior mechanical resilience, broad bandgap, and large electric field breakdown strength draw interest in the use of SiC as a semiconductor material. With exceptional hardness and lightweight nature, SiC wafers and substrates serve as robust platforms for the production of high-power, high-frequency electronic components. In comparison to traditional silicon devices, SiC-based power devices boast swifter switching speeds, elevated voltages, diminished parasitic resistances, compact dimensions, and reduced cooling necessities. Its main application areas are high-frequency power electronic devices (Schottky diodes, MOSFET, JFET, BJT, PIN diodes, IGBT), RF transistors, and optoelectronic devices (it is applied in backing material of blue LED).

Hangzhou Shalom EO offers custom SiC crystal wafers, the wafers offer optimum results in LED solid-state lighting and high-frequency devices, in extreme environmental applications such as aerospace, military industry, and nuclear energy.

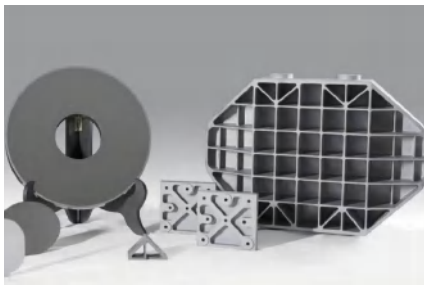
Specifications:

Size	10x3, 10x5, 10x10, 15x15, 20x15, 20x20	dia2" x 0.33mm, dia2" x 0.43mm, dia4"x0.35mm	
Thickness	0.5mm, 1.0mm	Polishing	Single or Double-side Polished
Crystal Orientation	<001>±0.5°	R\Redirection Precision	±0.5°
Redirection the Edge	2°(special in 1°)	Note	Special sizes and orientations are available upon request
Ra:	≤5Å(5μm×5μm)		

Basic Properties:

Growth Method	MOCVD	Crystal Structure	M6
Unit Cell Constant	a=3.08 Å c=15.08 Å	Sequence	ABCACB
Direction	<0001> 3.5°	With Clearance	2.93 eV
Hardness	9.2(mohs)	Heat Travels @300K	5 W/ cm.k
Dielectric Constants	e(11)=e(22)=9.66 e(33)=10.33		

Precision Silicon Carbide (SiC) Ceramics



- Thermal Stability, Outstanding Hardness, Radiation, Corrosion Resistance and Wear Resistance
- Near-Net-Size Molding, Shrinkage Rate Less Than 1% During the Reaction Sintering Process
- Complex Structures Are Realizable
- Good Green Body Machinability, Green Body Accuracy down to 0.1mm
- Excellent Optical Machinability, The Roughness Can Be Better Than 3mm
- Space Radiation Resistance: Resistant to Atomic Oxygen and Radiation

SiC ceramics, or silicon carbide ceramics, are a class of advanced engineering materials renowned for their prominent holistic properties and versatile functions catering to comprehensive industries. Derived from silicon carbide, these ceramics offer exceptional thermal stability, outstanding hardness, corrosion resistance, and wear resistance. Through processes such as hot pressing or sintering, SiC ceramics are crafted to meet the demands of diverse applications including semiconductor, automobile, mechanical and chemical industries, environmental protection, space, satellite, information electronics, etc.

Shalom EO offers precision SiC ceramics manufactured using gel injection molding and densification sintering techniques. Utilizing industrial-leading research results, our state-of-the-art fabrication techniques ensure the provision of high-quality silicon carbide ceramics with the following technical advantages:

1. Near-net-size molding: The product exhibits minimal shrinkage (less than 1%) during the reaction sintering process. This enhances the yield of SiC ceramics with intricate shapes, enabling high-precision manufacturing.
2. Realization of complex structures: Various complicated shapes including semi-closed backs and hollowed-out structures can be achieved, reducing overall weight and accommodating a wider range of application needs.
3. Excellent green body machinability: The intermediate green body stage can be efficiently processed using CNC machining, achieving an accuracy of 0.1mm at best. This significantly reduces the finishing cycle of the sintered body, enhancing efficiency and lowering costs.
4. Superior optical machinability: After optical processing, the surface roughness can be improved to better than 3nm, obtaining high-quality finishes.

Besides, our precision SiC Ceramics have excellent specific stiffness (almost four times the magnitude that of ULE materials) and thermal stability (almost four times the magnitude of Be materials), it is also resistant to space radiation and proton oxygen. These properties ensure that the precision SiC ceramics provide reliable performance in demanding environments.

Specifications:

Densityρ (g/cm3)	3.02	Young's Modulus E (GPa)	345
Thermal Cond. λ (W/ (m·K))	180	CTE α (ppm/K at RT)	2.4
Specific Stability E/ρ	114.24	Thermal Stability λ/α	75

Comparison Chart of SiC Ceramics and Other Materials

Material	Density (g/cm3)	Young's Modulus E(GPa)	Thermal Cond. λ(W/ (m·K)	CTE α (ppm/K at RT)	Specific Stability E/ρ	Thermal Stability λ/α
Preferred Values	Small	Large	Large	Small	Large	Large
Corning Fused Silica	2.2	73	1.4	0.5	33.18	2.8
Corning ULE	2.21	67	1.3	0.015	30.32	86.67
Schott Zerodur	2.53	92	1.46	0.02	36.36	73
Be	1.85	287	216	11.3	155.14	19.12
Shalom EO-SiC Ceramics	3.02	345	180	2.4	114.24	75
6061Aluminum	2.7	68	167	23	25.19	7.26
Single Crystal Silicon	2.33	130	148	2.5	55.79	59.2

Shalom EO also offers products made by SiC ceramics like SiC Mirrors (including Ultra-large-aperture Mirrors, Vibrating Mirrors, Scanning mirrors, and Fast Speed Mirror), Silicon Carbide Structural Components (Monolithic SiC Ceramic Frames, Installation Substrates, etc.), and Precision Silicon Carbide Suction Discs & Substrates for Semiconductors, Integrated Circuits/IGT. Customized requirements and volume manufacturing are both available.

The features of these SIC ceramic-based products are listed below:

1） SiC Mirrors:

Ultra-lightweight:

- back rib thickness 1-3mm
- skeleton structure further reduces weight
- lightweight rate up to 90%; minimum surface density better than 10kg/m2.

Complex structure mirrors:

- skeleton structure to reduce the weight of mirror blanks
- back semi-closed structure to improve the rigidity of mirror blanks
- optical-mechanical integration structure to reduce the weight of the system, reduce the thermal mismatch, and enhance the environmental adaptability.

Vibrating mirrors, scanning mirrors, fast mirrors:

- low rotational moment of inertia
- high resonance frequency; high thermal stability
- non-toxic (a fine substitute for Be)

2） Silicon Carbide Structural Components

Silicon carbide structural components: precision integrated silicon carbide frames, mounting substrates and other types of structural components, used in modern optoelectronic systems, semiconductor manufacturing equipment and other fields

3） Precision silicon carbide suction cups and substrates

- Used in semiconductor manufacturing equipment, integrated circuits/IGBT and other device substrates
- Dense and homogeneous material, good processability
- high surface precision and high form precision

Fused Silica and Optical Quartz Glass Wafers



- Brands: Corning HPFS 7980/7979/7978, JGS1 UV Optical Quartz Glass
- Substrates for semiconductors, micro-electronics, Optical Windows, Optical Mirrors, etc.
- Single Crystal Quartz Wafers and Substrates are also available
- Custom dimensions, shapes, and more
- Maximum Diameter 450mm, Minimum thickness 0.03mm
- Applications: UV applications, Optical and Laser Systems, Spacecrafts, and semiconductors, etc.

Fused Silica and Optical Quartz Glass Wafers or Substrates are thin discs or square plates of variable dimensions or shapes made from Fused Silica or Quartz Glass, which are transparent solids composed of refined SiO2 in amorphous form gained through the rapid cooling of molten Silica.

In general, SiO2 glass variants exhibit a set of unique benefits that make them indispensable in the fabrication of high-tech products. First, it has exceptional thermal properties, quartz glass will not deform at temperatures <1400°C, with the additional virtue of low thermal expansion, and excellent thermal shock resistance. Second, Fused Silica glass is hard and robust. Other advantages of Fused Silica and Optical Quartz Glass include wide UV-IR transmission, chemical inertia, radiation resistance, low refractive indices, and low chromatic dispersion, etc. The application fields of fused silica glass are wide, encompassing optical and laser systems, UV-light sanitation, semiconductors, spacecraft, etc.

Hangzhou Shalom EO offers Fused Silica and Optical Quartz Glass Wafers or Substrates made from glass materials equivalent to the brands stated: Corning HPFS 7980/7979/7978, JGS1(Optical Quartz Glass). Large-size wafers and substrates are available with a maximum diameter of 450mm and smooth surfaces with surface roughness of < 5 Å. All the specifications could be customized at your request.

Specifications:

Brands and Materials:	Corning :Fused silica 7980/7978/7979 etc. Made in China: Fused Silica JGS1, Single Crystal Quartz etc.
Diameters	Up to 450mm(4inch/6inch/8inch/12inch/350mm/450mm)
Thickness	Minimum 30μm(0.1mm/0.2mm/0.3mm/0.5mm/1mm etc)
Dimensional Tolerance	+/- 0.2mm
Thickness Tolerance	+/- 0.1mm
Thickness Variation(TTV)	< 2μm
Surface Roughness (Rz)	< 0.05μm
Surface Quality	40/20 S/D, or custom
Bow/Warp	<20μm
Other customized specifications available	

Material Properties:

Density (at 25°C / 77°F)	2.201 g/cm^3
Shear Modulus	30.6 GPa
Young's Modulus	2.1 GPa
Bulk Modulus	37.4 GPa
Modulus of Rupture, abraded	52.4 MPa
Poisson's Ratio	0.179
Knoop Hardness (100g load)	522 kg/mm^2
Compressive Strength	1.14 GPa
Tensile Strength	54 MPa
Strain Point	893°C/1639.4°F
Thermal Expansion Coefficients	0.52 ppm/K @5-35°C 0.57 ppm/K @0-200°C 0.48 ppm/K @-100 - 200°C
Annealing Point	1042°C/1907.6°F
Softening Point	1585°C/2885°F
Thermal Conductivity	1.38 W/m·K
Thermal Diffusivity	0.0075 cm^2/s
Specific Heat	0.770 J/g·K
Refractive Index	Nd = 1.45840 @589nm
Dielectric Constant	E = 3.8

Note: The parameters presented here are representative of commercially available Fused Silica and are for references only. Please view the data sheets of the brands if you want to check the individual properties of each brand.

Strontium Titanate (SrTiO3) Substrates



- Twinless crystal structure, excellent physical and good mechanical properties
- Maximum diameter: 35mm, typical thickness 0.5 /1.0mm
- Stocked and custom SrTiO3 substrate
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Other applications: epitaxial growth of HTSC and oxide thin films (e.g., YBCO, Bi-system, La-system, etc.), Special optical windows, high-quality sputtering, Magnet Sputtering, Pulsed Laser Deposition (PLD)

Strontium Titanate or SrTiO3 (STO) single crystal has a twinless crystal structure and very good physical and mechanical properties for film growth. STO provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTSC (High-Temperature Superconductor) and various oxide thin films. Its lattice constant (3.905Å) matches well with the common high TC superconductive material YBCO (lattice constant 3.88 Å). STO is also a suitable platform for other high TC films such as Bi-system, La-system, and others. SrTiO3 single crystal has been utilized for special optical windows and as a high-quality sputtering target as well. It can also accommodate diverse film growth technologies such as Magnet Sputtering, Pulsed Laser Deposition (PLD), Vaporization, MOCVD, CVD, laser MBE, etc. Films made with these materials and technologies on SrTiO3 wafers exhibit excellent performance.
Hangzhou Shalom EO provides stocked standard SrTiO3 (or STO) wafers and customized wafers.

Specifications:

Materials	SrTiO3 crystals	Orientations	＜100＞, ＜110＞, ＜111＞
Orientation Error	±0.5°	Maximum Diameter	35mm
Typical Thickness	0.5mm, 1.0mm	Thickness Tolerance	±0.05mm
Size Tolerance	±0.1mm	Surface Finish	SSP or DSP
Roughness	Ra<0.5nm	Cleanness and Package	class 1000 clean room, class 100 bags

Basic Properties:

Crystal Structure	M6	Growth Method	Blaze method
Unit Cell Constant	a=3.905Å	Twin Structure	Twin free
Color	Colorless to light yellow	Melt Point（℃）	2080
Density（g/cm3）	5.175（g/cm3）	Hardness	6-6.5（mohs）
Thermal Expansion（/℃）	9.4×10-6	Thermal Conductivity	120 milliwatts/cm °C at 100 °C
Dielectric Constants	ε=300	Chemical Stability	Insoluble in water
Tangent Loss	~5×10-4（300k） ~3×10-4（77k）	Specific Resistivity	> 107Ohm/cm
Transmission Range	0.4 to 6 μm	Refraction Index	nc = 2.380 nd = 2.409 nf = 2.488
Dispersion	(nf - nc) = 0.108		

Product List of SrTiO3 Substrates

Code	Size	Thickness	Orientation	Surface Finish	Unit Price
642-001	5x5mm	0.5mm	<100>	SSP	Inquire
642-002	5x5mm	0.5mm	<100>	DSP	Inquire
642-003	5x5mm	0.5mm	<110>	SSP	Inquire
642-004	5x5mm	0.5mm	<111>	SSP	Inquire
642-005	10x10mm	0.5mm	<100>	SSP	Inquire
642-006	10x10mm	0.5mm	<100>	DSP	Inquire
642-007	10x10mm	0.5mm	<110>	SSP	Inquire
642-008	10x10mm	0.5mm	<111>	SSP	Inquire
642-009	Φ12.7mm	0.5mm	<100>	SSP	Inquire
642-010	Φ12.7mm	0.5mm	<100>	DSP	Inquire
642-011	Φ20mm	0.5mm	<100>	SSP	Inquire
642-012	Φ20mm	0.5mm	<100>	DSP	Inquire
642-013	Φ25.4mm	0.5mm	<100>	SSP	Inquire
642-014	φ25.4mm	0.5mm	<100>	DSP	Inquire

Fe:SrTiO3 Crystals and Substrates



- Similar crystal structure to SrTiO3
- Typical Thickness: 0.5/1.0mm or customized
- Typical Orientations:<100> <110> <111>
- Clean package: class 1000 clean room and class 100 bags
- Single side or double sides polished optional
- Fe concentration (%): 0.05%, 0.04%

Iron Doped Strontium Titanate Crystal Substrate (Fe:STO) is manufactured through adding small amounts of Iron into SrTiO3 lattice. The dielectric and magnetic properties grant Fe-doped SrTiO3 crystal substrate usages in field-effect transistors (FETs), HEMTs, MRAM, magnetic field sensors, etc. Hangzhou Shalom EO provides 0.05%, 0.04% iron doping concentration.

Specifications:

Material	Fe:SrTiO3	Size(mm)	10×3, 10×5, 10×10, 15×15, 20×15
Thickness	0.5mm, 1.0mm	Size Tolerance	<±0.1mm
Thickness Tolerance	<±0.015mm (special requirement can reach <±0.005mm)	Polishing	Single or Double surface polished (SSP or DSP)
Orientations	<100>, <110>, <111>	Redirection Precision	±0.5°
Redirection the Edge	2°(special in 1°)		

Basic Properties:

Crystal Structure	Cubic	Growth Method	Flame Method
Lattice Constant	a=3.905Å	Fe Concentration(%)	0.05%, 0.04%
Melt Point(℃)	2080	Density(g/cm3)	5.122
Hardness(mohs)	6-6.5	Dielectric Constants	ε=5.20
Chemical Stability	Insoluble in Water	Coefficient of Thermal Expansion(/℃)	9.4×10-6
Thermal Expansion Coefficient	10.4×10-6/k	Loss Tangent	~5×10-4(300k) ~3×10-4(77k)

Nb:SrTiO3 Crystals and Substrates



- Different electrical resistivities depending on the Nb doping concentration
- Similar crystal structure to SrTiO3
- Maximum diameters: Φ2.5″
- Clean package: class 1000 clean room and class 100 bags
- Typical Orientation of Nb: SrTiO3 substrates: <100>, <110> and <111>
- Nb Concentration (wt%): 0.1-1.0

Niobium (Nb) doped SrTiO3 (NSTO) single crystal has a similar structure to SrTiO3. NSTO crystals have different electrical resistivities depending on the Nb doping concentration.

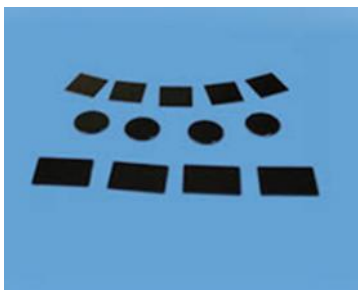
Specifications:

Size	10x3, 10x5, 10x10, 15x15, 20x15, 20x20, Φ15, Φ20, Φ1″, Φ2″, Φ2.6″	Thickness	0.5mm, 1.0mm
Polishing	Single or Double-side Polished	Crystal Orientation	<100> <110> <111>
redirection Precision	±0.5°	Redirection the Edge	2°(special in 1°)
Note	Special size and orientation are available upon request	Ra	≤5Å(5μm×5μm)

Basic Properties :

Nb:SrTiO3	A	B	C	D
Nb Concentration (wt%)	1.0	0.7	0.4	0.1
Resistivity Ohm-cm	0.0035	0.0070	0.05	0.08
Migration Rates cm2/vs	9.0	8.5	8.5	6.5
Characteristics	Nb:SrTiO3 has a similar structure with SrTiO3, but the former has electrical conductivity.			

Nd:SrTiO3 Crystals and Substrates



- Similar crystal structure to SrTiO3
- Thickness:0.5/1.0mm or customized
- Single side or double sides polished optional
- Typical Orientation of Nb:SrTiO3 substrates: <100>, <110> and <111>
- Clean package: class 1000 clean room and class 100 bags
- Nd concentration(%): 0.05

Neodymium-doped Strontium titanate (Nd: SrTiO3) single crystal has a similar structure to SrTiO3 crystal, which matches well with the lattice of perovskite structure materials. We can provide Nd: SrTiO3 single crystal substrate with 0.05% Nd concentration.

Specification:

Material	Nd:SrTiO3	Size(mm)	10×3, 10×5, 10×10, 15×15, 20×15 customized special orientation and size of the substrate is available.
Thickness	0.5mm, 1.0mm	Size Tolerance	<±0.1mm
Thickness Tolerance(mm)	<±0.015mm (special requirement can reach <±0.005mm)	Polishing	Single or Double surface polished (SSP or DSP)
Orientations	<100>, <110>, <111>	Redirection Precision	±0.5°
Redirection the Edge	2°(special in 1°)		

Basic Properties:

Crystal Structure	Cubic	Growth Method	Flame Method
Lattice Constant	a=3.905Å	Nb Concentration(%)	0.05%
Melt Point(℃)	2080	Density(g/cm3)	5.122
Hardness(mohs)	6-6.5	Dielectric Constants	ε=5.20
Chemical Stability	Insoluble in Water	Coefficient of Thermal Expansion(/℃)	9.4×10-6
Thermal Expansion Coefficient	10.4×10-6/k	Loss Tangent	~5×10-4(300k) ~3×10-4(77k)

Terbium Gallium Garnet (TGG) Crystals and Substrates



- Large Verdet constant and low optical loss
- High thermal conduction and laser-damaged threshold
- Excellent for Faraday devices (Rotator and Isolator) in the range of 400nm-1100nm
- Clean package: class 1000 clean room and class 100 bags
- Typical orientation of TGG substrates: ＜111＞
- Applications: Faraday devices, lasers, and optical fiber system

Terbium Gallium Garnet (TGG) single crystal, with large Verdet constant, low optical loss, high thermal conduction, and high laser-damaged threshold, has become an excellent magneto-optical material used to manufacture Faraday devices (Rotator and Isolator) operating in the range of 400nm-1100nm (excluding 470 - 500nm), which finds widespread utilities in YAG, Ti-doped sapphire, multi-stage amplification, Annular, seed injected lasers. Shalom EO provides customized and stocked TGG substrates for magnetic and ferroelectricity film growth.

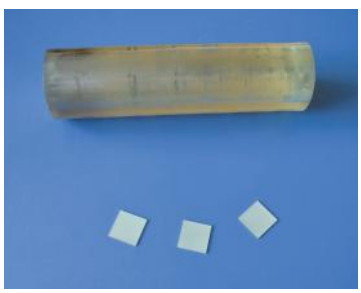
Specification:

Material	TGG(Terbium Gallium Garne) single crystal	Orientations	<111>±5 °
Wavefront Distortion	<λ/8 wave total @633nm	Extinction Ratio	A:>30dB，B:>28dB
Diameter Tolerance	±0.1mm	Length Tolerance	±0.05mm
Chamfer	0.2mm @ 45°	Flatness	<λ/10 wave at 633nm
Parallelism	<1 arc minutes	Perpendicularity	<5 arc minutes
Surface Quality	10/5 S/D per MIL-O13830A		

Basic Properties:

Chemical Formula	Tb3Ga5O12	Crystal Structure	Cubic
Lattice Constant	a=12.355Å	Growth Method	Czochraiski
Density(g/cm3)	7.13	Hardness(mohs)	8.0
Melting Point(℃)	1725℃	Refractive Index	1.954 @1064nm
Thermal Conductivity	9.4×10-6 /K	Verdet Constant	0.12min/Oe.cm at 1064nm

Titanium Dioxide (TiO2) Crystals and Substrates



- Large refractive index and availability of high birefringence
- Fine physical and chemical stability
- Clean package: class 1000 clean room and class 100 bags
- Single side or double sides polished optional
- Applications: Making spectroscope prism and polarizing devices (optoisolator and beam splitter), grow thin films of VO2, CrO2, SnO2, and β-Ga2O3

Single Crystal Titanium Dioxide (TiO2), also known as Rutile, belonging to the Tetragonal structure, lattice constants a = 4.5937 Å, c = 2.9587 Å, TiO2 is often used to grow thin films of VO2, CrO2, SnO2, and β-Ga2O3. TiO2 substrates provide an excellent supportive platform for growing VO2 thin film which would otherwise be difficult to grow. Optical grade rutile titanium dioxide (TiO2) single crystal substrate has large birefringence, a large refractive index, making it a good material for spectral prism and polarizing devices (such as optical isolators and beam splitters). Compared with YVO4, the TiO2 crystals have better physical and chemical stabilities.

Hangzhou Shalom EO offers TiO2 (Titanium dioxide) Crystals and Substrates with orientation error within ±0.5 degrees, and conventional thicknesses of 0.5mm and 1.0mm. These substrates feature a high-precision surface finish with a roughness of Ra<0.5nm, available in both single or double-surface polished versions (SSP or DSP). Should you require further information or have any inquiries about our products, please feel free to reach out.

Specifications:

Materials	TiO2(Titanium dioxide)	Orientation Error	±0.5deg.
Typical Size	5×5×10mm,5×10×10mm,10×10×0.5mm	Typical Thickness	0.5mm, 1.0mm
Thickness Tolerance	±0.05mm	Size Tolerance	±0.1mm
Surface Finish	1	Roughness	Ra<0.5nm
Roughness	Ra<0.5nm	Polishing	Single or Double surface polished (SSP or DSP)

Basic Properties:

Crystal Structure	M4	Lattice Constant	a=4.5937Å c=2.9587Å
Density	4.26(g/cm3)	Melt Point	1870℃
Dielectric Constants	dη/dT：a：-0.72×106 /k c：-0.42×10-6 /k	Linear Expansion Coefficient	a：7.14×106 c：9.19×106
Hardness	7(Mohs)		

YAlO3(YAP) Crystals and Substrates



- Excellent optical performance, physical properties, and chemical properties
- Maximum Diameter: 2 inches, typical thickness 0.5/1.0mm
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Orientation of YAP substrates:＜100＞, ＜010＞ and ＜001＞
- Applications: for High Temperature Superconductor (HTSC) film growth, II-V nitride, and oxide film growth, and lasers

Hangzhou Shalom EO provides Yttrium Orthoaluminate YAlO3(YAP) crystal substrates. With a perovskite-like orthorhombic crystal structure, lattice constant a=5.176 Å, b=5.307 Å, c=7.355 Å, YAP substrate is often used for the growth of high-temperature superconducting (HTS) thin film, II-V nitride, and oxide films. Yttrium Aluminum Oxide (YAP) is a transparent crystal with a wide band gap, making it suitable for applications in the near-infrared (NIR) region. Rare earth and transition-metal ions dopants located in YAP substrates find wide uses for applications in lasers.

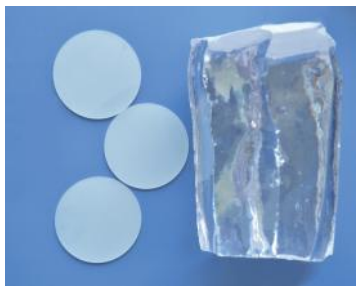
Specifications:

Material	YAlO3 single crystals	Size(mm)	10×3,10×5,10×10,15×15,20×15,20×20 Φ30mm
Thickness	0.5mm, 1.0mm	Crystal Orientation	(100), (010), (001) ±0.5°
Redirection the Edge	2°(special in 1°)	Note	Special sizes and orientations are available upon request
Ra	≤5Å(5μm×5μm)		

Basic Properties:

Crystal Structure	monoclinic	Density	5.37g/cm3
Polishing	Single or Double	Lattice Constant	a=5.176 Å, b=5.307 Å, c=7.355 Å
Melt Point	1870℃	Dielectric Constants	ε 16-20
Thermal Expansion(℃)	2-10×10-6		

Yttria Stabilized Zirconia (YSZ) Crystals and Substrates



- High hardness and high chemical resistance, excellent wear resistance
- Typical thickness 0.5/1.0mm
- Surface Roughness: Ra < 0.5nm
- Clean package: class 1000 clean room and class 100 bags
- Typical Orientation of YSZ substrates: ＜001＞
- Applications: high-temperature superconducting films, thin film growth of single and multiplication oxides, ceramics, refractories, machinery, electronics, optics, and aerospace, etc.

Yttria Stabilized Zirconia (YSZ) single-crystal substrate is manufactured by adding 8-13 mol% Yttrium to the melts of Zirconium Oxide (Zirconia) as stabilizer to prevent the Zirconia from breaking up during the cooling process, Yttria Stabilized Zirconia (YSZ) single crystals feature moderate cost, wear-resistance, and good match with multiple single and multiplication oxides. YSZ was one of the earliest materials used for stabilizing high-temperature superconducting thin films of YBC If using it for optical transmission experiments then get double-side polished versions, otherwise single-side polished is the most common. Exhibiting outstanding physical and chemical properties, Shalom EO's YSZ substrates have versatile functions in various fields, such as ceramics, refractories, machinery, electronics, optics, and aerospace, etc.

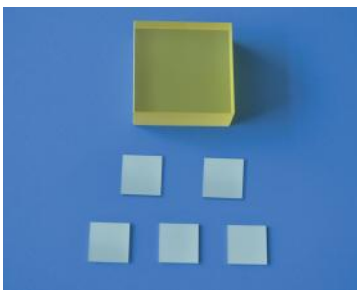
Specifications:

Size(mm)	10x3, 10x5, 10x10, 15x15, 20x15, 20x20, dia2" x 0.33mm dia2" x 0.43mm 15 x 15 mm	Thickness	0.5mm, 1.0mm
Polishing	Single or Double Side Polished	Crystal Orientation	<001>±0.5°
redirection Precision	±0.5°	Redirection the Edge	2°(special in 1°)
Note	Special sizes and orientations are available upon request	Ra	≤5Å(5μm×5μm)

Basic Properties:

Crystal Structure	M3	Growth Method	Skull melting, cold crucible method
Unit Cell Constant	a=5.147 Å	Melt Point(℃)	2700
Density(g/cm3)	6.0	Hardness	8-8.5(mohs)
Purity	99.99%	Thermal Expansion(/℃)	10.3×10-6
Dielectric Constants	ε=27		

Zinc Oxide (ZnO) Crystals and Substrates



- Single side or double sides polished optional
- Fine physical and chemical stability
- Wide bandgap
- Customized substrates and wafers are available
- Applications: wide bandgap semiconductor thin growth, GaN film growth, semiconductor photoelectronic devices, magnetic semiconductors, blue and violet optoelectronics applications

Zinc Oxide (ZnO) crystal substrates are a wide bandgap semiconductor material. As a single crystal semiconductor, the bandgap is in the 3.4 eV range which makes it attractive for manifold blue and violet optoelectronic applications as well as UV devices. The availability of large-size ZnO crystals also gives ZnO a competitive edge over GaN. substrates show a distinguished advantage for the thin film growth Gallium Nitride (GaN). Like GaN, it has a wurtzite structure, with lattice constants well matched to GaN (a=3.249, c=5.205). The lattice mismatch between ZnO and GaN is only ε=0.017. Perhaps the most important attribute is that it is a soft compliant material that is believed to take up the lattice stress in preference to the growing GaN thin film. However, ZnO has the disadvantage that it dissociates in ammonia at temperatures above 600°C.

Hangzhou Shalom EO offers customized high-quality ZnO crystal substrates and wafers.

Specifications:

Material	ZnO single crystal	Size(mm)	25×25×0.5, 10×10×0.5, 10×5×0.5, 5×5×0.5
Orientation	<0001>, <11-20>, <10-10>±0.5°	Polishing	Single or Double surface polished (SSP or DSP)
Transparency Range	0.4-0.6 μm; > 50%@2μm	Surface Roughness	Ra: ≦ 0.5nm

Basic Properties:

Crystal Structure	M6	Lattice Constant	a=3.252Å c=5.313 Å
Density	ε=5.7	Hardness	4(mohs)
Melt Point(℃)	1975	Coefficient of Thermal Expansion	a /6.5 x 10-6 /℃ c /3.7 x 10-6 /℃
Specific Heat(g.m)	0.125 cal	Pyroelectric Constant	1200 mv/k @ 300 ℃
Thermal Conductivity(cm/k)	0.006 cal	Chemical Stability	Insoluble in water

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