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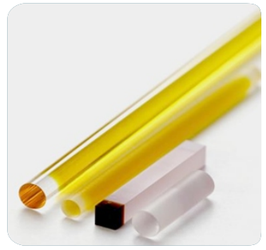
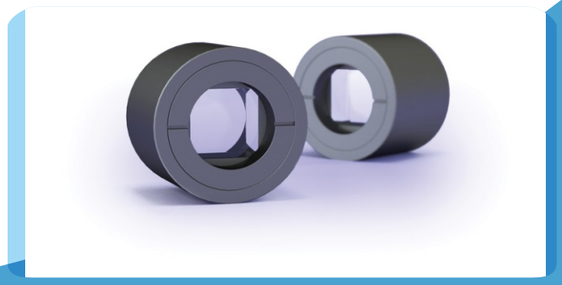
United Photonics Technology

"Your most reliable partner!"





优联合光电科技（福州）有限公司
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About Us

United Photonics Technology (UPT) was founded by Mr. Huo and a team of extensive experienced engineers and technicians. Mr. Huo has over 25 years of combined experience in optics manufacturing and engineering management. UPT is a progressive company dedicated to precision optical and crystal components design, production and sales.

UPT has strong capability to produce various custom–made precision optical and crystal components, like lenses, prisms, windows, filters, waveplates, polarization optics, BBO/LBO NLO crystals and YVO4 crystals etc., moreover, various coating designs are also available from us. Our products are widely used in automation, metrology, life sciences, lasers, semiconductor, military and medical equipment.

UPT upholds the vision of that “Quality” is the foundation of our survival and the reason why our customer to choose us. Adhere to philosophy of "Integrity, Quality, Value and Innovation", with solid technical strength, advanced production management and quality control system, we are committed to providing the highest level of customer service, competitive pricing, speedy delivery and high–quality products to satisfy our global customers. “Your Satisfaction, Our Priority”, we look forward to becoming your most reliable partner!

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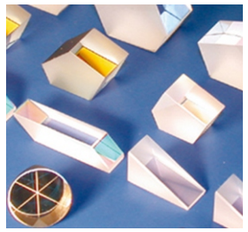
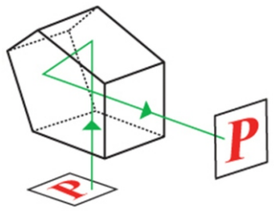
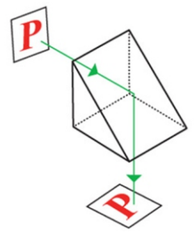
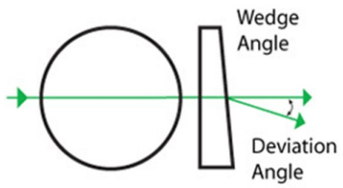
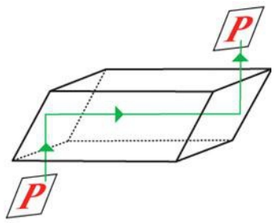
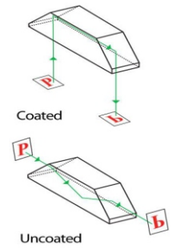
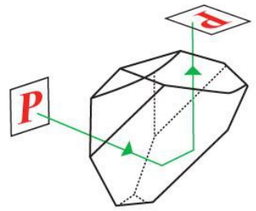
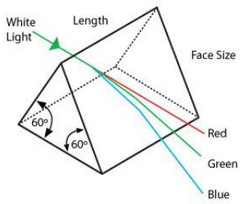
Prism (Micro Optics)

UPT provides many kinds of high precision prisms, including Penta Prism, Beamsplitter Penta Prism, Right Angle Prism, and Corner Cube. We also provide micro Penta Prism and Right Angle Prism which are widely used in optical communication, such as Micro optical switches.



TYPE	ILLUSTRATION	PROPERTIES AND APPLICATIONS
Penta Prism / Beamsplitter Penta Prism		Penta prism can deviate an incident beam without inverting or reversing to 90° .The deviation angle of 90° is independent of any rotation of the prism about an axis parallel to the line of intersection of the two reflecting faces.
Right Angle Prism		A right–angle prism is used as a mirror to deviate light through 90 degrees and also as a reflector to deflect light through 180 degrees by total internal reflection.
Wedge		Wedge prism can be used to bend a laser beam to a set angle 80 degrees by total internal reflection.
Rhomboid Prism		Rhomboid prism (off–set prism) is commonly used to displace a laser beam without changing its direction. In imaging applications, rhomboid prisms will displace the optical axis without inverting the image.

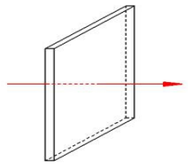
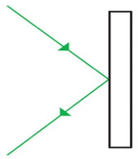
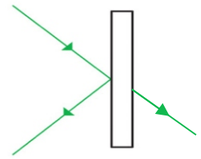
TYPE	ILLUSTRATION	PROPERTIES AND APPLICATIONS
Dove Prism		The prism rotates the image without changing the direction of the input beam, which is parallel to hypotenuse. Rotation of the prisms in relation to the subject causes double rotations of the image. Dove Prism should be used in the parallel beam.
(AMICI roof prism) Dispersion Prism		AMICI reflection prism called also roof prism or right angle roof prism, which deflects the beam through an angle of 90° and inverts the image. For this reason, this prism is perfect for erecting images inverted by the objectives.
EQUILATERAL dispersion prism		EQUILATERAL dispersion prisms have three equal 60° angles, which are made of optical materials with high difference of refraction indexes for different wavelength, such as the SF10.

Specifications:.

Material:	**Bk7, Fused Silica,N–SF10, MgfF2 or other optical glass upon request**
Dimension (mm):	**0.5–280mm upon request.**
Dimension Tolerance (mm):	**+/–0.2 (General), +0/–0.05 (High Precision)**
Angle Tolerance:	**5 arc min. (General), 5 arc sec. (High Precision)**
Flatness (per 25mm@633nm):	**λ (General), λ /10 (High Precision)**
Clear Aperture:	**>80% (small size),>90%(large size)**
Bevel (mm):	**0.1–0.3**
Surface Quality:	**60/40 (General), 20/10 (High Precision)**
Coating:	**Uncoated,AR,HR,PR,Metal coating upon request**

Note:Other kinds of prisms and other specifications are also available on request.

Window ,Mirror and Filter

TYPE	ILLUSTRATION	PROPERTIES AND APPLICATIONS
Window		Windows are used to isolate different physical environments while allowing light to pass. A window is usually parallel and is likely to be anti reflection coated.
Mirror		Mirrors are used to reflection light
Dielectric Coating Filter		Dielectric coating filter that reflect useless wavelength and transmits only specific wavelengths.

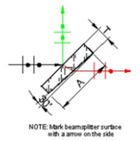
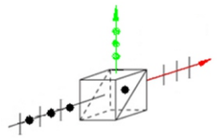
Specifications:.

Material:	BK7 or other Optical Glass Upon request
Diameter (Φmm)	**1.0*1.0mm to Φ350mm**
Typical Thickness (mm)	**0.5, 1.0, 2.0, 3.0, 5.0, 6.0**
Diameter Tolerance (mm)	**+/−0.2 (General), +0.0/−0.02 (High Precision)**
Thickness Tolerance (mm)	**±0.2 (General), ±0.05 (High Precision)**
Clear Aperture:	**>80% (Small Size), >95% (Large Size)**
Parallelism	**3 min. (General), 3 sec. (High Precision)**
Surface Quality:	**80/50 (General), 10/5 (High Precision)**
Flatness (per 25mm@633nm)	**λ (General), λ /10 (High Precision)**
Bevel (face width x 450)	**<0.25mm**
Coating:	**Uncoated, AR, HR, PR, Coating, etc.**

Note:Other kinds of plano optics and other specifications are also available on request.

BeamSplitter

Beamsplitters play an integral role in optical systems by dividing, recombining, and managing the directions of multiple beam paths. Beams of light may be divided into separate wavelengths and polarization states, or they may be split for specific values of transmittance and reflectance that are averaged over or invariant to wavelength and polarization.

TYPE	ILLUSTRATION	PROPERTIES AND APPLICATIONS
BeamSplitter		BeamSplitters are used to split or combine two perpendicular polarization laser beam. The performance of beamsplitters is mainly dependent on the coating specifications.
Cube beamsplitter		Cube beamsplitters are constructed by cementing two precision right angle prism together with appropriate interference coating on the hypotenuse surface. The absorption loss to the coating is minimal transmission and reflection approach 50% (average) though output is partially polarized.

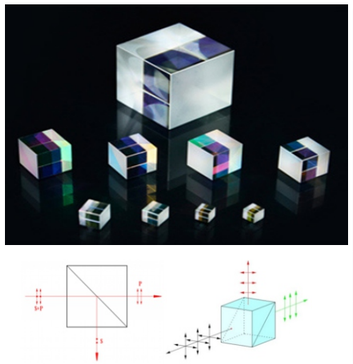
Specifications:.

Material:	**BK7 Grade A Optical Glass Or Fused silica, SF11 and etc**
Dimension (mm):	**0.5x0.5 ~ 100x100**
Dimension Tolerance (mm):	**+/−0.2 (General), +0/−0.05 (High Precision)**
Thickness Tolerance (mm):	**+/−0.2 (General), +0/−0.05 (High Precision)**
Beam Deviation:	**< 3 arc min.(General), < 30 arc sec.(High Precision)**
Surface Quality:	**60/40 (General), 20/10 (High Precision)**
Flatness (per 25mm@633nm):	**λ /4**
Clear Aperture:	**> 90%**
T/R :	**50/50 ± 5%, for random polarization T=(Ts+Tp)/2, R=(Rs+Rp)/2**
Coating:	**Hypotenuse face−−−−−−−Partial reflection coating All input and output faces:Anti reflection coating**
Typical Coating wavelength:	**Narrow Band: 532, 632.8, 650, 808, 850, 980, 1064, 1310, 1550 nm Broadband:450−650, 650−900, 900−1200, 1200−1550, 1500−1610 nm**

Note: Beamspliters in other sizes,split ratios and coatings are also availble on request.

Polarization Beamsplitter

Polarization Cube Beamsplitters split randomly polarized beams into two orthogonal,linearly,polarized components–S–polarized light is reflected at a 90deg.Angle while P–polarized light is transmitted.Each beamsplitter consists of a pair of precision high tolerance right angle prisms cemented together with a dielectric coating on the hypotenuse of one of prisms.
We mainly offer following Polarization Beamsplitter products:



TYPE	DIFFERENCE SPECS
PBS	Extinction Ratio>100:1 Principal Transmittance: Tp>95% and Ts<1% Principal Reflectance: Rs>99% and Rp<5%
High Extinction PBS	Tp: Ts> 3000:1 Principal Transmittance: Tpave>95%&Rs>99.5%for Broadband Tpave>96%&Rs>99.5% for Narrowband
High Power PBS	10J/cm2@1064nm,10HZ,20ns
High Power High Extinction PBS	10J/cm2@1064nm,10HZ,20ns,Tp: Ts> 3000:1

Specifications:.

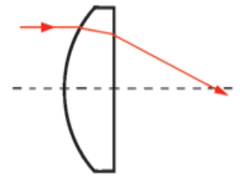
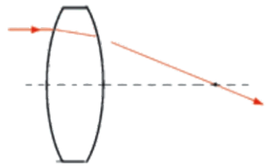
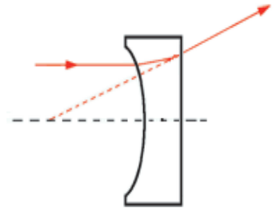
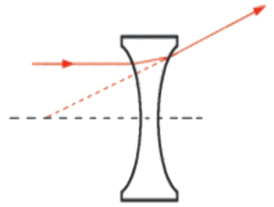
Material:	**BK7 Grade A Optical Glass Or Fused silica, SF11 and etc**
Dimension (mm):	**0.5x0.5 ~ 100x100**
Dimension Tolerance (mm):	**+/–0.2 (General), +0/–0.05 (High Precision)**
Thickness Tolerance (mm):	**+/–0.2 (General), +0/–0.05 (High Precision)**
Beam Deviation:	**< 3 arc min.(General), < 30 arc sec.(High Precision)**
Surface Quality:	**60/40 (General), 20/10 (High Precision)**
Flatness (per 25mm@633nm):	**λ /4 or λ /8**
Extinction Ratio:	**As the specs of PBS type as above**
Coating:	**Hypotenuse face–––––––Partial reflection coating All input and output faces:Anti reflection coating**
Typical Coating wavelength:	**Narrow Band: 532, 632.8, 808, 980, 1064, 1310, 1550 nm Broadband:450–650, 650–850, 900–1200, 1200–1550, 1500–1610 nm**
Typical Size:	**3.2x3.2x3.2 mm, 5x5x5mm, 10x10x10mm, 12.7x12.7x12.7mm, 15x15x15mm, 20x20x20mm, 25.4x25.4x25.4mm**

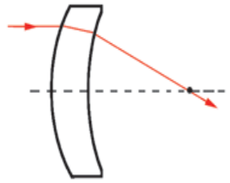
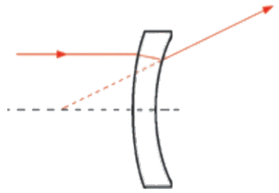
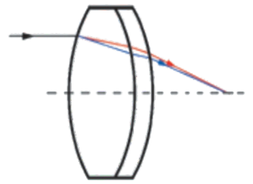
Note: PBS in other sizes, wavelengths are available upon request.

Lens

Spherical Lens

Lenses have many applications ranging from the simple collection of a laser beam to precision imaging and image transfer. Lenses are classified as single lenses, cylindrical lenses and achromatic lenses. These lenses are made of BK7, fused silica and CaF2. Special focusing systems can be designed by our engineers upon request.

TYPE	ILLUSTRATION	PROPERTIES AND APPLICATIONS
Plano–Convex Lens		Positive focus length. Most suitable where one conjugate is more than five times the other, e.g. in sensor applications or for use with near collimated light. Also where both conjugates are on the same side of the lens, e.g. as an add–on lens to increase the numerical aperture.
Double–Convex Lens		Most suitable where the conjugates are on opposite sides of the lenses and the ratio of the distances is less than 5:1, e.g. as simple image relay components.
Plano–Concave Lens		Negative lens with the form most suitable where one conjugate is more than five times the other, e.g. producing divergent light from a collimated input beam.
Double–Concave Lens		Negative lens with the form most suitable to producing divergent light or a virtual image, where the input light is converging.

TYPE	ILLUSTRATION	PROPERTIES AND APPLICATIONS
Positive Meniscus Lens		These lenses may be used to increase the numerical aperture of a positive lens assembly, without an undue increase in the aberrations.
Negative Meniscus Lens		These lenses may be used to increase the numerical aperture of a positive lens assembly, without an undue increase in the aberrations.
Achromatic Lens		These lenses have considerably reduced values of spherical aberrations. Best used to replace single components where performance must be improved.

Specifications:.

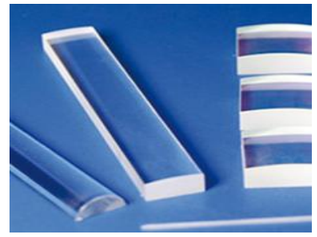
	GENERAL	HIGH PRECISION
Material:	**N–BK7, CDGM H–K9L, Fused silica, CaF2, Sapphire, Ge and other optical glass**	
Diameter tolerance	**+0.0, 0.15mm**	**+0.0, 0.05mm**
Paraxial focal length	**±2%**	**±0.5%**
Centration	**<3'**	**<1'**
Clear aperture	**80%**	**90%**
Surface quality	**60–40 scratch and dig**	**10–5 scratch and dig**
Surface irregularity	**< λ/4**	**< λ/8**
Protective bevel	**0.25 + 0.25, –0.0mm**	**0.2 ± 0.1mm**
Coating	**Uncoating , AR or Single layer MgF2 coating upon request**	

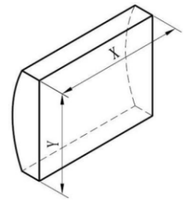
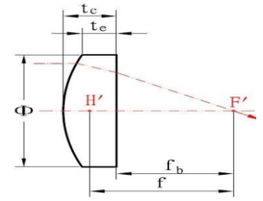
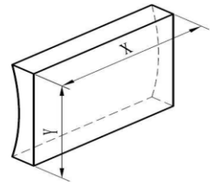
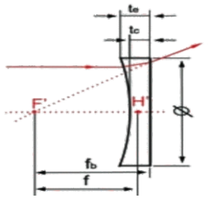
Note: Other kinds of lenses and other specifications are also available on request.

Lens

Cylindrical Lenses

Cylindrical lenses are used to correct astigmatism in the eye and in rangefinders, to produce astigmatism, stretching a point of light into a line, they are widely used in bar code scanning, projection optics systems, laser measurement systems and holography.
Cylindrical lenses are available in either plano–concave or plano–convex configurations from UPT.



LENSES	ILLUSTRATION-1	ILLUSTRATION-2
Plano convex cylinder lens		
Plano concave cylinder lens		

Specifications:.

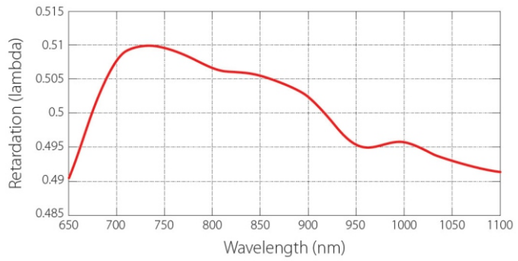
Material:	**Schott N–BK7, CDGM H–K9L, Fused silica, CaF2, Sapphire**
Diameter tolerance	**+0/–0.1mm**
Thickness Tolerance	**+0/–0.1mm**
Paraxial focal length	**±1%**
Centration	**<3'**
Clear aperture	**85%**
Surface quality	**40–20 scratch and dig**
Surface irregularity	**< λ/4**
Protective bevel	**0.2 mm**
Coating	**Uncoating , AR or Single layer MgF2 coating upon request**

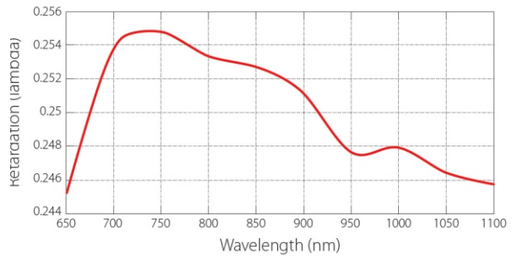
Note: Other kinds of cylindrical lenses and other specifications are also available on request.

Achromatic Waveplate

Unlike standard waveplates, Achromatic Waveplates, provide a constant phase shift independent of the wavelength of light that is used.This wavelength independence is achieved by using two different crystalline materials to yield quarter– or half–wave retardation over a broad spectral range.The Retardation tolerance of our AWPs is better than λ/100 over the entire wavelength range.The flat response of an AWP is ideal for use with tunable lasers,multiple laser–line systems and other broad spectrum sources.ers,multiple laser–line systems and other broad–spectrum sources.

Achromatic Waveplate Curves





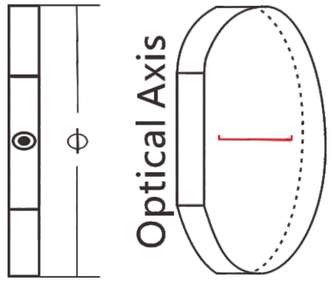
Specifications:.

Material:	Quartz & MgF2 Crystal
Diameter:	2*2 – D50mm, Typical Diameter 10,12,7,15,20,25.4 mm
Diameter Tolerance:	+0.0, –0.2mm
WavefrontDistortion:	λ/4 @ 632.8nm
Wavelength range:	240~2100nm
Retardation Tolerance:	<λ/100
Parallelism:	<3 arc second
Surface Quality:	40/20
Clear Aperture:	>90%
Coating	Rave<0.8% @450~680nm, Rave<0.8% @700~1000nm, Rave<0.5% @950~1300nm,Rave<0.5% @1200~1650nm
Retardation of Typical	λ/4, λ/2 OEM upon request

Note: Other sizes, wavelengths are available upon request.

IR Waveplate

UPT supplies a range of IR waveplates. These items are fabricated from high quality IR–grade MgF2 crystals which providing high transmission and very low wavefront distortion.
Due to the long operational wavelengths, we provide most of these plates in "true zero order"(if the thickness is too thin, the one–order waveplate is also available). This ensures the highest performance with regards to temperature and wavelength independence as well as power handling capability.
A range of standard items are available with the following specifications.



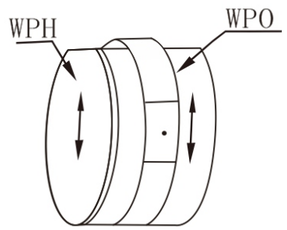
Specifications:.

Material:	Quartz & MgF2 Crystal
Diameter Tolerance:	+0.0, –0.2mm
Clear Aperture:	>90%
WavefrontDistortion:	λ/8 @ 633nm
Surface Quality:	40/20 Scratch/Dig
Retardation Tolerance:	<λ/300
Parallelism:	<1″
Coating	R<0.5% @ central wavelength
Standard Wavelength	λ/2: 3500nm, 4000nm, 4500nm, 5000nm, 5500nm, 6000nm, 6500nm, 7000nm λ/4: 3500nm, 4000nm, 4500nm, 5000nm, 5500nm, 6000nm, 6500nm, 7000nm
Standard Dimension	D12.7mm, D20mm, D25.4mm (without holder)

Note: Custom specification of size, shape and wavelength are available upon request.

UV Achromatic waveplate

UPT offers special designed of UV achromatic waveplate by using four peices of plates, It consists of our product WPO and WPH,



Specifications:.

Material:	**Quartz & MgF2 Crystal**
Diameter Tolerance:	**+0.0, –0.2mm**
Clear Aperture:	**>85%**
WavefrontDistortion:	**λ /4 @ 633nm**
Surface Quality:	**40/20 Scratch/Dig**
Retardation Tolerance:	**< λ /90**
Parallelism:	**<1″**
Coating	**R<2.5% @ central wavelength**
Standard Wavelength	**UV230–280nm; UV280–350nm; UV350–450nm;**
Standard Dimension	**D12.7mm, D20mm, D25.4mm (without holder)**

Note: Custom specification of size, shape and wavelength are available upon request.

Zero Order Waveplate

The zero order waveplate is designed to give a retardance of zero full waves, plus the desired fraction. Zero order waveplate shows better performances than multiple order waveplate, it has broad bandwidth and a lower sensitivity to temperature and wavlength changes. There are four type of zero order waveplates as below:

TYPE	Different of application	
Zero Order Waveplate –Cemented	○ Cemented by Epoxy ○ Double Retardation Plates ○ Broad Spectral Bandwidth	○ Wide Temperature bandwidth ○ AR coated and Mounted
Zero Order Waveplate –Optically Contacted	○ Optically Contacted ○ Double Retardation Plates ○ Broad Spectral Bandwidth	○ Wide Temperature bandwidth ○ Hight Damage Threshold
Zero Order Waveplate –Air–spaced	○ Air Spaced ○ Double Retardation Plates ○ Broad Spectral Bandwidth	○ Wide Temperature bandwidth ○ Hight Damage Threshold ○ AR coated and Mounted
True Zero Order Waveplate –Cemented	○ Thickness 1.0~2mm ○ Broad Spectral Bandwidth ○ Wide Temperature bandwidth	○ Wide Angle Bandwidth ○ Cemented by Expoy

Specifications:.

Material:	**Quartz Crystal**
Diameter:	**2*2 – D50mm, Typical Diameter 10,12,7,15,20,25.4 mm**
Diameter Tolerance:	**+0.0, –0.1mm**
WavefrontDistortion:	**λ /8 @ 632.8nm**
Retardation Tolerance:	**λ /300**
Parallelism:	**<1 arc second**
Surface Quality:	**20/10**
Clear Aperture:	**>90%**
Coating	**AR/AR: R<0.2% @ wavelength**
Retardation of Typical	**λ /4, λ /2 OEM upon request**

Note: Other sizes, wavelengths are available upon request.

Multiple Order Waveplate

TYPE	Different of application
Low Order Waveplate	○ Multiple order waveplate means the retardance of a light path will undergo a certain number of full wavelength shifts in addition to the fractional design retardance. The thickness of multi order waveplate is always around 0.5–2mm. Compared with zero order waveplate, multi order waveplate is more sensitive to wavelength and temperature changes. However, they are less expensive and widely used in many applications where the increased sensitivities are not critical.
Dual Wavelengths Waveplate	○ Dual Wavelengths waveplate is one type of multiple order waveplate,which provide a specific retardance at two different wavelengths (e.g. quarter wave at 1064nm and half wave at 532nm).

Specifications:.

Material:	Quartz
Diameter:	2*2 – D50mm, Typical Diameter 10,12,7,15,20,25.4 mm
Diameter Tolerance:	+0.0, –0.1mm
WavefrontDistortion:	λ /8 @ 632.8nm
Retardation Tolerance:	λ /300
Parallelism:	<1 arc second
Surface Quality:	20/10
Clear Aperture:	>90%
Coating	S1&S2: R<0.2% @ wavelength
Retardation of Typical for Low oer waveplate	λ /4, λ /2 OEM upon request
Phase Retardation of Typical for Dual waveplate	λ @1064nm + λ /2 @532nm; λ /2 @1064nm + λ @532nm; other OEM upon request

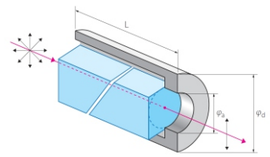
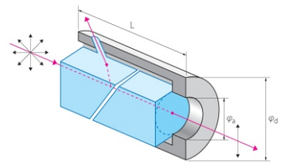
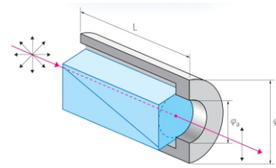
Note: Other sizes, wavelengths are available upon request.

Polarizer

A polarizer is an important optical component that is widely used in laser systems to generate the linear polarization laser. UPT makes following polarizers with four materials, YVO 4, Calcite,a –BBO, and Quartz, suitable for the widest spectrum and high polarization purity.

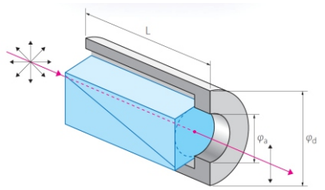
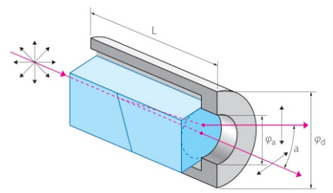
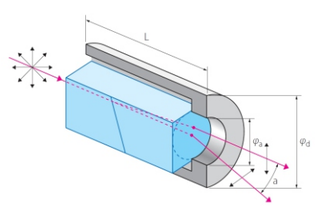
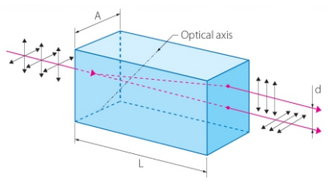
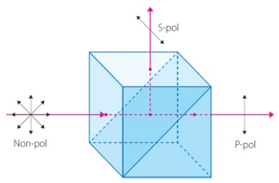
Comparison of the four materials property as below:

Material	YVO4	Calcite	a–BBO	Quartz
Transparency	500–4000nm	350–2200nm	200–3500nm	200–2300nm
Crystal Class (Uniaxial)	Positive no=na=nb,ne=nc	Negative no=na=nb,ne=nc	Negative no=na=nb,ne=nc	Positive no=na=nb,ne=nc
Mohs Hardness	5	3	4.5	7
Thermal Expansion Coefficient	aa=4.43x10–6/K ac=11.37x10–6/K	aa=24.39x10–6/K ac=5.68x10–6/K	aa=4x10–6/K ac=36x10–6/K	aa=6.2x10–6/K ac=10.7x10–6/K
Hygroscopic Susceptibility	No Hygroscopic	Low to moisture	High	No Hygroscopic

POLARIZER	MATERIAL	ILLUSTRATION	PROPERTIES AND APPLICATIONS
Glan Taylor Polarizer	a–BBO(190–3500nm) Calcite(350–2300nm) YVO4(500–4000nm)		○ Air–spaced ○ Close to Brewster's Angle Cutting ○ Low L/A=0.8 ○ For medium power application.
Glan Laser Polarizer	a–BBO(200–3500nm) Calcite(350–2300nm) YVO4(500–4000nm)		○ Air–spaced. ○ Close to Brewster's angle Cutting ○ Mounted with escape window ○ Suitable for high power applications ○ L/A=1.5
Glan Thompson Polarizer	a–BBO(220–900nm) Calcite(350–2300nm)		○ Cemented ○ Suitable for low power applications ○ Wide acceptance angle

Please refer to the website for more standard designs, OEM are also available upon request .

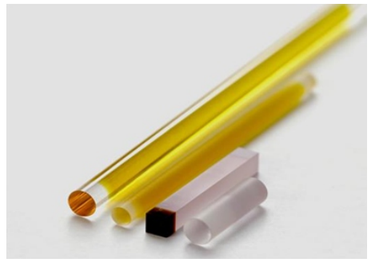
Polarizer

POLARIZER	MATERIAL	ILLUSTRATION	PROPERTIES AND APPLICATIONS
UV Broadband Glan Thompson Polarizer (200–3300nm)	a–BBO(220–3300nm)		○ Cemented ○ Suitable for low power ○ Wide acceptance angle
Wollaston Polarizer	a–BBO(200–3500nm) Calcite(350–2300nm) YVO4(500–4000nm) Quartz(200–2300nm)		○ Cemented ○ Separate ordinary and extraordinary beams at certain angle ○ Suitable for low power application and where the large deviation is required
Rochon Polarizer	a–BBO(200–3500nm) YVO4(500–4000nm) Quartz(200–2300nm)		○ a–BBO is used to guarantee a wide transmission range ○ Especially suitable for UV application ○ Split the ordinary and extraordinary ray, but only ordinary beam is deviated
Polarization Beam Displacers	YVO4 (488 nm– 3400 nm) Calcite (350–2300nm)		○ Cemented ○ Suitable for low power application ○ Separate an Input into Two Orthogonally Polarized Beams ○ L/A=1.5
Polarization Cube Beamsplitter	BK7 Grade A Optical Glass Or Fused silica, SF11		○ Split the ordinary and extraordinary ray. The ordinary beam is deviated 90° ○ Refer to chapter "Beamsplitter" for detailed information.

Please refer to the website for more standard designs, OEM are also available upon request .

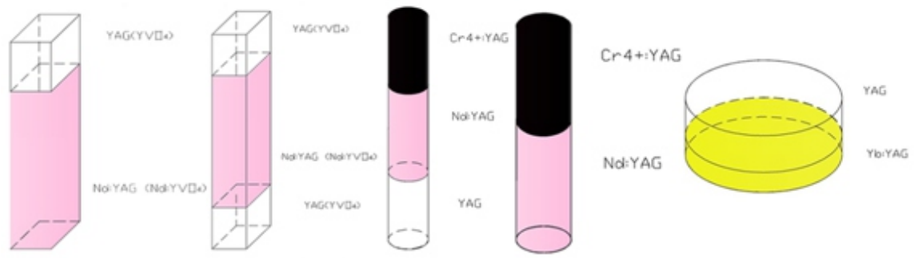
Diffusion Bonded Crystal

Diffusion Bonded Crystals consist of one laser crystal and one or two undoped material. They are combined by optical contact method and further bonded under high temperature. Diffusion Bonded Crystal helps to decrease thermal lensing effect considerably.



UPT can supply Diffusion Bonded Crystals as below:

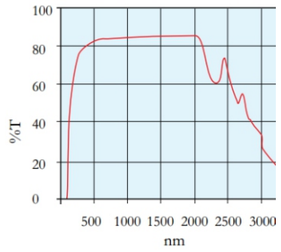
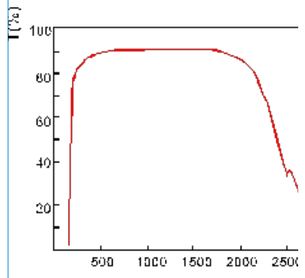
Material	Doping concentration (atm) or Optical Density(cm–1)	Aperture (mm)	Length of laser crystal(mm)
YVO4+ Nd:YVO4 + YVO4	D0.1%–3%	1×1–20×20	0.15–30
		Φ2–15	
YAG+Nd:YAG+ YAG	0.1%–2.5%	1×1–20×20	0.125–200
		Φ2–15	
YAG+Nd:YAG+ Cr4+:YAG	0.1%–2.5% / 0.6~7	1×1–20×20	0.125–200
		Φ2–15	
YAG+Nd:Ce:YAG+ Cr4+:YAG	0.6~7	1×1–20×20	0.125–200
		Φ2–10	
YAG+Yb:YAG+ Cr4+:YAG	1%–45% / 0.6~7	1×1–20×20	0.125–200
		Φ2–10	



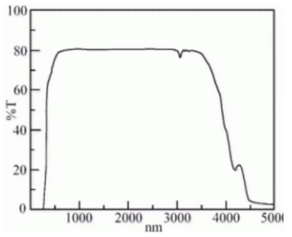
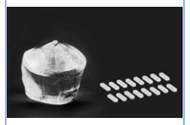
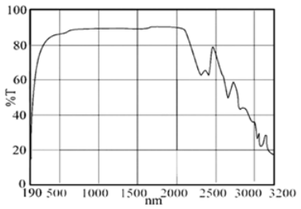
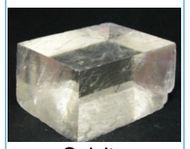
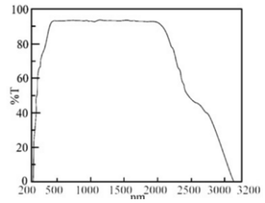
For detail specifications or other assembly types ,Please refer to our website.

Nonlinear Optical Crystal

Frequency conversion is the process used in laser applications to convert the laser wavelength range, these applications includes frequency doubling or second harmonic generation (SHG), sum frequency generation (SFG), differential–frequency generation (DFG), and optical parametric generation (OPG). Nonlinear optical (NLO) crystals are the medium used for the laser frequency conversion process.

Crystals Type	Advantages	Main application	Transmission Curve
 BBO	○ T broad phase matching (SHG) range from 409.6nm to 3500nm ○ Wide transmission region from 190nm to 3500nm ○ Large effective SHG coefficient ○ High damage threshold of 10 GW/cm2 for 100 ps pulse–widths at 1064nm ○ High optical homogeneity with Dn 10–6/cm2 ○ Wide temperature bandwidth of about 55° (for type I SHG 1064nm) ○ Good mechanical and physical properties	○ Second, third, fourth and fifth harmonic generation of Nd lasers ○ Frequency–doubling, –tripling and –mixing of Dye lasers ○ Second, third and fourth harmonic generation of Ti:Al O and Alexandrite lasers ○ Optical parametric amplifiers (OPA) and optical parametric oscillators (OPO) ○ Frequency–doubling of Argon ion, Cu–vapor and Ruby laser	
 LBO	○ Broad transparency range from 160nm to 2600nm ○ (see Figure 1); ○ High optical homogeneity (δ n ≈ 10–6/cm) and being free of inclusion; ○ Relatively large effective SHG coefficient (about three times that of KDP); ○ High damage threshold; ○ Wide acceptance angle and small walk–off; ○ Type I and type II non –critical phase matching (NCPM) in a wide wavelength range; Spectral NCPM near 1300nm.	○ SHG, THG of Nd lasers ○ SHG of Ti:Sapphire, Cr:LiSAF and Alexandrite lasers ○ OPA and OPO	

Birefingent Crystal

Crystals Type	Advantages	Main application	Illustration
 YVO4	○ T wide transparency range ○ larger birefringence ○ an excellent synthetic substitute for calcite and rutile crystal.	It has a wide transparency range and larger birefringence, which make it widely used in many applications in particular fiber optics field. YVO4 is an excellent synthetic substitute for calcite and rutile crystal.	 Transparency Curve of YVO
 a–BBO	○ High temperature phase of α –BBO ○ large birefringent coefficient and wide transmission window ranged from 189nm to 3500nm. ○ high chemical stability and medium hardness	a –BBO are excellent crystals to replace Calcite, TiO2 LiBbO3 etc. in Glan Taylor and Glan Thompson polarizers,Glan laser as well as walk–off beamsplitters, especially for high power and UV polarizers.	 Transparency Curve of α –BBO
 Calcite	○ a natural crystal that has high birefringence and wide spectral ○ transmission and available in reasonably sized rhombs.	○ a negative uniaxial crystal that has high birefringence, wide spectral transmission and availability in reasonably sized rhombs. an ideal material for use as visible wavelengths and near IR polarizers such as Glan Taylor, Glan Thompson and Glan Laser.	 Transparency Curve of Calcite

Other Crystals

Crystals Type	Advantages	Main application	Illustration
TGG	○ Large Verdet Constant (35 Rad T–1m–1); ○ Low optical losses (<0.1%/cm); ○ High thermal conductivity (7.4W m–1K–1); ○ High laser damage threshold (>1GW/cm2).	○ Faraday Rotator; ○ Optical Isolator.	

Other Crystals

Crystals Type	Advantages	Main application	Illustration
YAG	○ Wide transmission range: transmission in 0. 25 – 5.0 μ m, no absorption in 2 –3 μ m; ○ Extremely hard and durable; ○ High thermal conductivity, 10 times better than glasses; ○ High bulk damage threshold; ○ High index of refraction and Non–birefringence.	○ Used for both UV and IR optics. It is particularly useful for high temperature and high–energy applications. ○ The mechanical and chemical stability of YAG crystal is similar to Sapphire. Sapphire is slightly birefringence, but YAG crystal is not birefringence and is available with high optical homogeneity.	

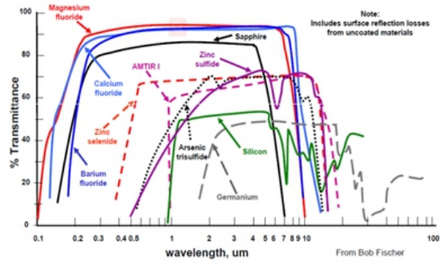
Specifications:

Dimension of Tolerance	**Dimension+/–0.1 mm, L: ±0.1mm**
Flatness	**λ/8 @ 632.8nm**
Wavefront distortion	**<λ/4@ 632.8nm**
Surface quality	**10/5 per MIL–O–13830A**
Parallelism	**10″**
Perpendicularity	**5′**
Bevel/chamfer	**<0.1mm@45deg.**
Chips	**<0.1mm**
Angle Tolerance	**△θ ≤ ±0.5° , △ϕ ≤ ±0.5°**
Coating	**AR/HR/P– coating Upon request**

Note: OEM Dimension, different axis angle cutting and coating and damage threshold upon request, others are available upon request. For detail datasheet specifications of standard polarizer, please visit our website.

Infrared Optics

UPT provides a variety of customized infrared optics, including lenses, windows, mirrors and prisms,which are made from Germanium,Silicon, CaF2,MgF2,BaF2, Sapphire, ZnSe and Zns , widely applied in high energy CO2lasers, infrared imaging and infrared sensors. The aspherical lenses made by SPDT(single point diamond turning) are also available.



Transmittance of IR glasses

Crystals Type	Property and application
Germanium (Ge)	Wavelength range from 2 –16 μ m; Fit for both MWIR (3–5 micro) and LWIR (8–12 micro) thermal imaging, IR imaging
Silicon (Si)	Wavelength range from 1.2–7 μ m Fit for Spectroscopy, MWIR Laser Systems, thermal imagingd LWIR (8–12 micro) thermal imaging, IR imaging
Calcium Fluoride (CaF2)	Wavelength range from 0.18–8 μ m Fit for Spectroscopy,Semiconductor Processing, Cooled Thermal Imaging
Magnesium Fluoride (MgF2)	Wavelength range from 0.2– 6.0 um Fit for machine vision, microscopy, and industrial applications.
Barium Fluoride (BaF2)	Wavelength range from 0.2–11 μ m Fit for MWIR (3–5 μ m) thermal imaging, IR imaging
Sapphire	Wavelength range from 0.2 to 5.5 μ m Extreme surface hardness and chemical resistance Fit for IR Laser Systems, Spectroscopy, and Rugged Environmental Equipment
ZincSelenide (ZnSe)	Wavelength range 3 –12 μ m Low Absorption, High Resistance to Thermal Shock Fit for thermal imaging, CO2 lasers, military and medical applications
Zinc Sulfide (ZnS)	Wavelength range0.4 to 13.5 μ m Excellent Transmission in Both Visible and IR, Harder and More Chemically Resistant than ZnSe Fit for thermal imaging

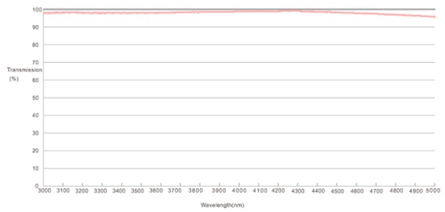
Infrared Optics

Specifications:.

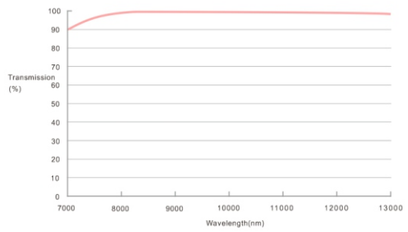
Type	Spherical Lens	Cylinderial Lens	Window , wedge
Material:	Si, Ge, CaF2, MgF2, BaF2, Sapphire, ZnSe , ZnS,		
Dimension and Tolerance	3.0–297mm+/–0.025	2–350mm+/–0.05	3.0–300mm+0/–0.1mm
Thickness and Tolerance	0.5–50mm+/–0.05	1–70mm+/–0.05	0.5–10mm+/–0.05
Flatness	λ /8 @633nm	λ /4 @633nm	λ /8 @633nm
Surface Quality	20/10 Scratch/Dig	20/10 Scratch/Dig	20/10 Scratch/Dig
Bevel	0.25mm	0.25mm	0.25mm
Centeration	< 0.5'	< 1'	< 0.5'

Coating:

3000–5000NM AR;
Material substrate:Ge / Si /CaF2
3000–5000nm AR,AOI0° , Both Side AR Reflectance: R<1%,
Transmittance(ave) >99%@3000–5000nm;

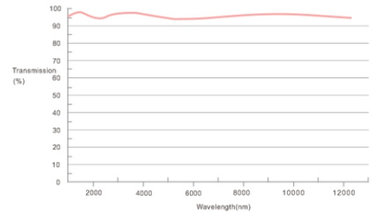


8000–12000NM AR;
Material substrate: Ge / CaF2
Design wavelength: AR @ 8000–12000nm AOI 0▮ ,
Both Side AR Reflectance: R<1%,
Transmittance(ave) >94%@8000–12000nm



Coating:

2000–14000NM AR
Material substrate: ZnSe / CaF2
Design wavelength: AR @2000–14000nm,AOI0▮ ,
Both Side AR Transmittance(ave) >95%@2000–14000nm



3000–5000NM AR+DLC
Material substrate: : Ge / Si
Design wavelength: AR @ 3000–5000nm,AOI 0▮
Side 1 3000–5000nm AR & Side 2 DLC
Both Side Coating Transmittance(ave) >94%@3000–5000nm