

CASIX

CASIX

A FABRINET COMPANY

CASIX Inc.

P.O. Box 1103

20 Fuxing Street, Fuxing Investment District
Fuzhou, Fujian 350014, China

Phone: +86 591 8362-0115 (International Sales)

+86 591 8362-7334 (China Sales)

Fax: +86 591 8362-1248

E-mail: Sales@casix.com



CASIX
A FABRINET COMPANY

www.casix.com

CASIX
A FABRINET COMPANY
福建华科光电有限公司



CASIX Inc.

CASIX
A FABRINET COMPANY

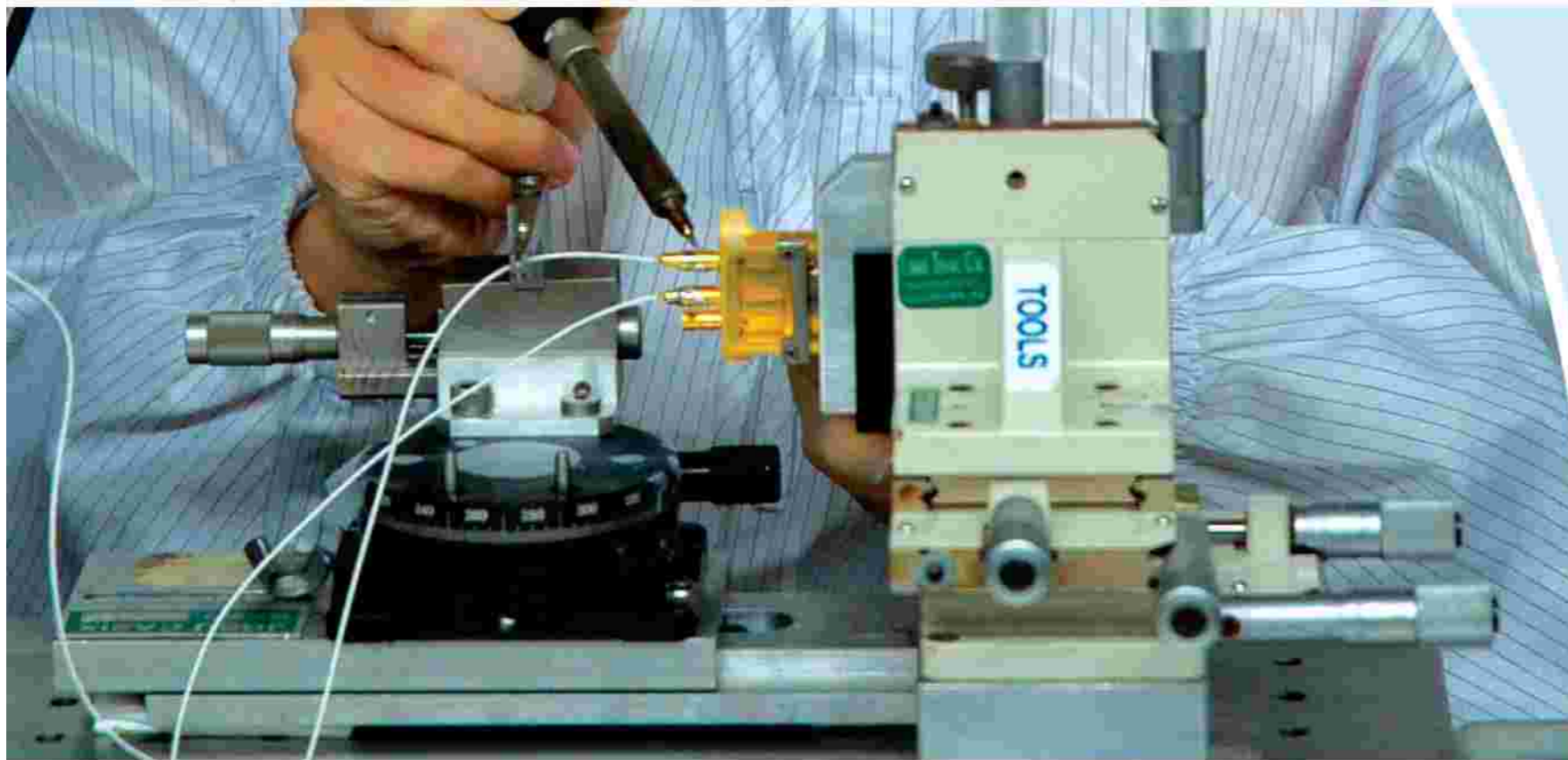
Casix Inc., founded in September 1992, is a wholly owned subsidiary of Fabrinet which is a renowned international company. Casix is located in the national AAAA scenic spot of Fuzhou in China. By striking to the spirit of "safety, unity, struggle, innovation and excellence" as well as international advanced management philosophies, Casix is pursuing excellence throughout its operation and ensures that our products satisfy the needs of our customers and the target markets.

Engaged in R&D, manufacturing excellence and quality improvement, Casix focus on developing and manufacturing high quality crystal, precision optics components and optical sub-assemblies for market applications in optical communication, commercial laser, instrumentation, surveying, measuring and scanning, and medical. Our products have supplied into the global leading customers. As a global partner of optical components, we seek to develop long term relationship with our customers and meeting their needs with quality engineering, manufacturing and excellent customer service.

In order to ensure the product quality, Casix has launched a comprehensive quality control system and a strict management system. The company was certified for ISO9001 by SGS UK in 1998, ISO14001 in 2006 and OHSAS18001 in 2009. To enhance our core competitiveness, we have carried into execution of the Enterprise Resources Management System (ERP). Allowing networked and improved company management and quality production.

2012 Casix obtained ISO 13485 management system for medical devices from SGS and FDA registered, registration number 3008133259.





Metrology Capability:

Casix supply all kinds of metrologies to ensure product quality and control fabrication process well. We own a testing center including digital interferometer zygo, focometer, Nikon profile projector, high precision angle meter, ellipsometer, X-ray goniometer, Lambda900 Spectrophotometer, Wyko NT9100 and so on. And moreover in the production line, we also set up some instruments for ensuring product quality. For example: Nd:YVO₄ IL test system, DPM power test system, photo-thermal common-path interferometers, optical spectrum analyzer. Furthermore, we add a new laser Marking Equipment which can mark according to customer's requirement.

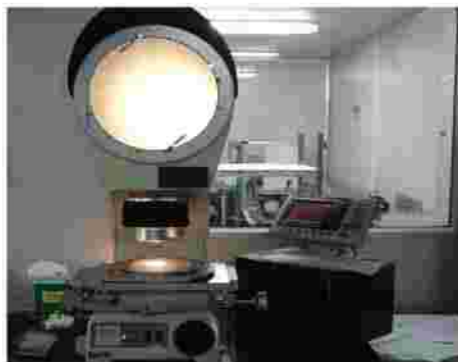
Name: Digital Interferometer Zygo

Inspection:
Wavefront Distortion
Surface Figure
Deflect Angle And Parallelism



Name: Nikon Profile projector

Inspection:
Dimension and Some Defects
Inspection Profiles(Shapes, such as angles and radii of curvature of cylinders etc.)



Name: Focometer

Inspection:
+/-EFL,FFL and BFL
Radii of Curvature
Centering Error (Both in Transmission and Reflection)



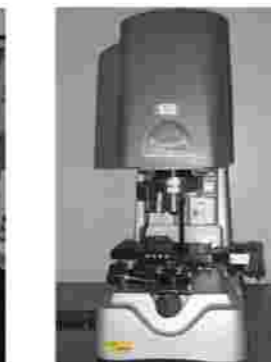
Name: Lambda900 spectrophotometer

Inspection:
Transmission, Absorption and Optical Density
Reflectivity Concentration of Doped Particles



Name: Wyko NT9100

Inspection:
Surface Roughness
Thin Film quality



new

Name: Damage Threshold Tester

Laser Source: 1064nm Plus Laser
Test range: 2.37~62.21 J/cm² or
215.1~5655.4 MW/cm²
Test Tolerance: 15%



> Contents

Crystal

YVO ₄ Crystal	07
Nd:YVO ₄ Crystal	08
Nd:GdVO ₄ Crystal	09
DPM Crystal	10
Nd:YAG Crystal	12
Cr ³⁺ :YAG Crystal	13
Diffusion Bonding Crystals	14
KTP Crystal	15
LBO Crystal	16
BBO Crystal	18
LiNbO ₃ Crystal	19
α-BBO Crystal	20
Calcite Crystal	21
Si Crystal	22
Ge Crystal	24

Optics

Laser Optics	25
Telecom Optics	26
Surveying Optics	27
Display Optics	29
Optical Prisms	31
Optical Windows	32
Optical Lenses	33
Super Small Achromatic Lens	35
Optical Beamsplitters	36
Optical Waveplates	38
Optical Polarizers	43
Chemically Activated Direct Bonding Optics	44

Fiber Optics

Pigtail	45
Collimator	46
Isolator	47
Etalons	48

Glass Components

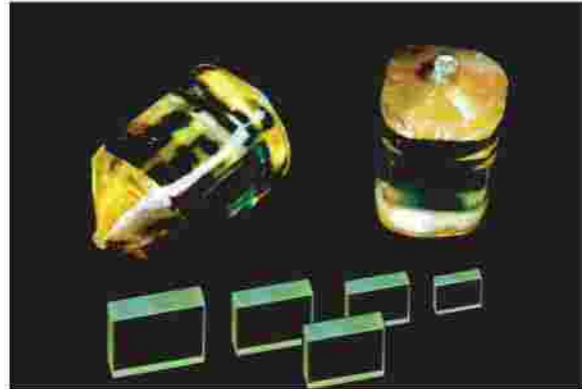
Ferrules and Sleeves	50
Glass Substrates	51

Coatings

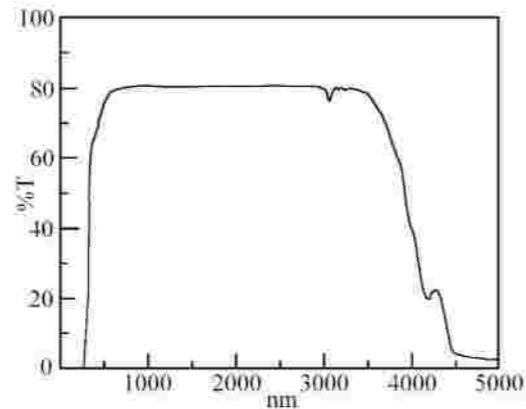
52



Yttrium Vanadate (YVO₄) Crystals



Yttrium Vanadate (YVO₄) crystals are positive uniaxial crystals grown using the Czochralski method. They have good mechanical and physical properties and are ideal for optical polarizing components because of their wide transparency range and large birefringence. They are an excellent synthetic substitute for Calcite (CaCO₃) and rutile (TiO₂) in many applications including fiber optic isolators and circulators, beam displacers, Glan polarizers and other polarizing optics.



Transparency Curve of YVO₄
(Thickness=1mm)

Capability:

Attribute	Commercial	High Precision
Optical Axis Orientation	±0.5°	±0.1°
Parallelism	20"	10"
Perpendicularity	15'	5'
Flatness	λ / 4	λ / 10
Surface Quality	40-20 scratch and dig	10-5 scratch and dig
Dimension Tolerance	±0.1mm	±0.005mm
AR Coating	R<0.2%@1550±40nm	Specified

Additional YVO₄ crystal and coating specifications are available upon request.

Neodymium Doped Yttrium Vanadate (Nd: YVO₄) Crystals

CASIX applies Czochralski (CZ) crystal growth technology to grow high grade Nd: YVO₄ crystals. With strict control of materials and the growth process, our Nd: YVO crystals feature low lasing wavelength absorption and high conversion efficiency. CASIX offers Nd: YVO₄ with doping from 0.1 atm% to 4.0 at%. Crystal boules and crystals are available in various sizes and coatings.



Main Features:

- Low lasing threshold and high slope efficiency
- Large stimulated emission cross-section at lasing wavelength
- High absorption over a wide pumping wavelength bandwidth
- Optical uniaxial and large birefringence emits polarized laser light

Capability:

Attribute	Commercial	High Precision
Nd: Dopant level	0.1 - 4.0atm%	
Wavefront distortion	λ / 4	λ / 8
Scattering Sites**	Invisible, probed with a He-Ne laser	
Orientation	±0.5°	±0.2°
Dimension Tolerance	±0.1mm	±0.01mm
End-faces Configuration	Flat	
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
Flatness	λ / 8	λ / 10
Parallelism	20"	10"
Intrinsic Loss	Less than 0.1%cm ⁻¹ ,@1064nm	

** : It's our internal inspection criterion on this spec.

Additional Nd:YVO₄ crystal and coating specifications are available upon request.

> Neodymium Doped Gadolinium Vanadate (Nd: GdVO₄) Crystals



Nd: GdVO₄ crystals are excellent laser crystals. They are ideal laser host materials for diode pumped solid state (DPSS) micro/mini lasers because of their good physical, optical and mechanical properties. They have higher slope efficiency than Nd: YAG crystals and better thermal conductivity and higher power output than Nd: YVO₄ crystals, so they are a good choice for high power output DPSS lasers. Using advanced growth technology, CASIX provides high grade Nd: GdVO₄ crystals with Nd doping from 0.1 atm% to 4.0 atm%. In addition, crystal components of various sizes and coatings are available.

Main Features:

- Large stimulated emission cross section at laser wavelength
- High absorption coefficient and wide bandwidth at pump wavelength
- Low dependency on pump wavelength
- Good thermal conductivity
- Low lasing threshold and high slope efficiency
- High laser induced damaged threshold
- Strongly polarized laser output

Capability:

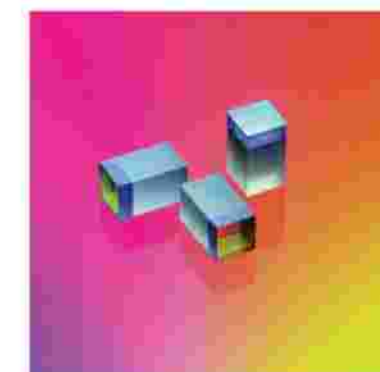
Attribute	Commercial	High Precision
Nd: Doping Level	0.5atm%, 3.0atm%	
Wavefront Distortion	$\lambda/4$	$\lambda/8$
Scattering Sites**	Invisible, probed with a He-Ne laser	
Orientation	$\pm 0.5^\circ$	$\pm 0.2^\circ$
End-faces Configuration	Flat	
Dimension Tolerance	$\pm 0.1\text{mm}$	$\pm 0.01\text{mm}$
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
Flatness	$\lambda/8$	$\lambda/10$
Parallelism	20"	10"
Perpendicularity	15'	5'

** : It's our internal inspection criterion on this spec.

Additional Nd:GdVO₄ crystals and coating specifications are available upon request.

> DPM Crystals

Diode-Pumped Solid State (DPSS) lasers are the ideal laser tools for applications such as pointing light shows, machining, material processing, spectroscopy, wafer inspection and medical diagnostics. CASIX's Diode-Pump Microchip (DPM) crystal assemblies combine Nd: YVO₄ and KTP and act as the laser core for green DPSS lasers. Applications for DPMs include green laser pointers, laser displays, DPSS green lasers and surveying laser systems.



Suggested applications:

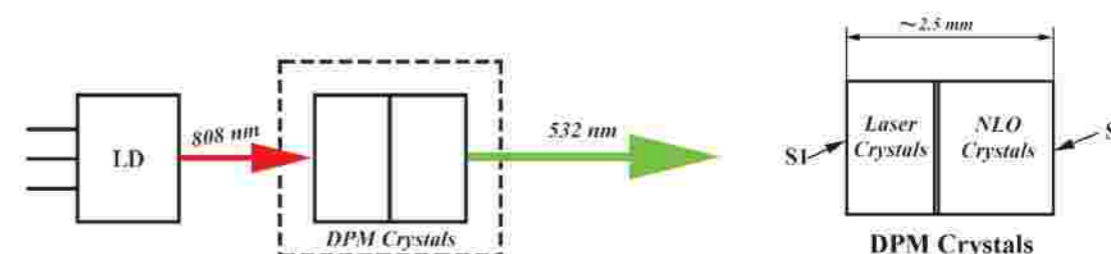
Pump power for the low power DPM crystals is less than 300mW and the generated green output power can reach 10mW.

Pump power for the middle power DPM crystals is less than 500mW and the generated green output power can reach 60mW.

Pump power for the high power DPM crystals is less than 600mW and the generated green output power can reach 100mW. Heat deposit mechanics are needed.

Capability:

Attribute	Commercial	High Precision
Parallelism	10 arc seconds	5 arc seconds
Output Wavelength	532nm	532nm
Mode	TEM00	TEM00
Pump Power	200mW; 300mW	200mW; 300mW
Output Power	>2.5mW; >20mW	>5mW; >30mW



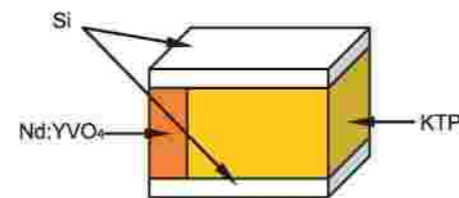
CASIX develop a High Performance Diode-pumped Microchip Crystal (Green DPM)

Application:

- Mini-Projector
- Display Laser
- DPSS Green Lasers
- Surveying Laser system
- Defence Laser System

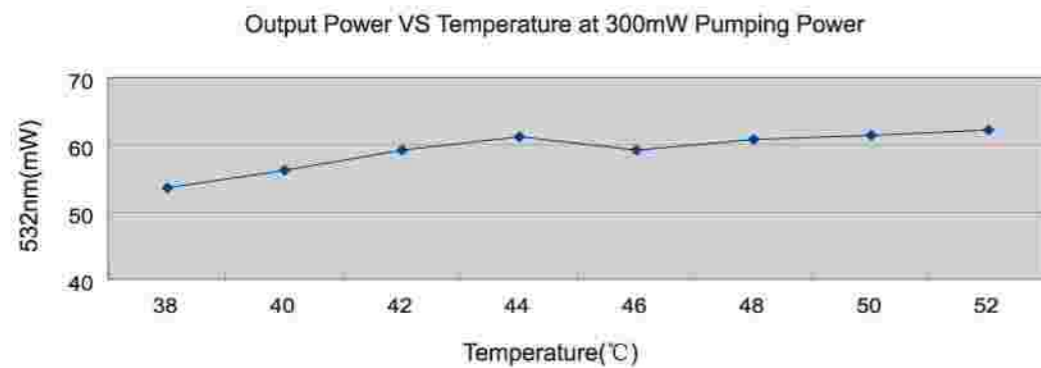
Feature:

- Output Power 532nm (mW): >40
- Conversion Efficiency: >20%
- Dimension: 2x2.5x2.5mm
- Polarization Ratio: >10:1
- Operating Temperature at crystal surface(°C): 35-50
- Output Beam Quality: TEM00



Data Curve:

- Output Power VS Temperature at 300mW pumping Power

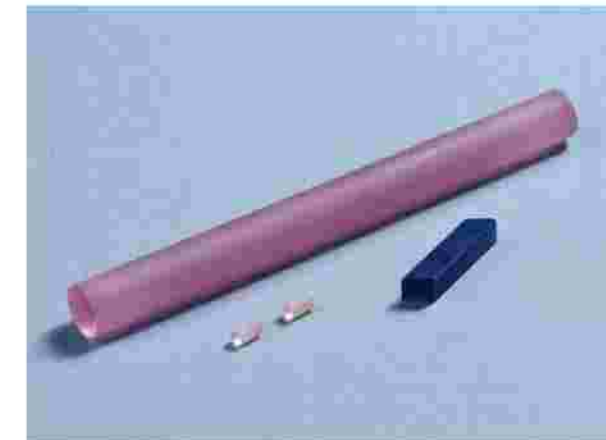


Advantage:

- High Conversion Efficiency
- High Extinction Rate
- Wider Temperature Range

➤ Neodymium Doped Yttrium Aluminum Garnet (Nd:YAG) Crystals

Nd:YAG crystals are the most widely used solid state laser materials today. CASIX offers Nd:YAG rods with high optical homogeneity, consistent performance, high processing accuracy and on time delivery. A variety of specifications and sizes from $\phi 3 \times 0.5\text{mm}$ to $\phi 12 \times 150\text{mm}$ are available.



Capability:

Attribute		Commercial	High Precision
Dopant Concentration		0.4atm% - 1.1atm%	
Orientation		$\pm 5^\circ$	$\pm 0.5^\circ$
Wavefront Distortion		$\lambda / 8$	$\lambda / 10$
Extinction Ratio		28dB	30dB
Dimension Tolerance		Nd:YAG Rod: Dia ± 0.1 , L $\pm 0.5\text{mm}$ Nd:YAG slab: $\pm 0.1\text{mm}$	Nd:YAG Rod: Dia ± 0.025 , L $\pm 0.25\text{mm}$ Nd:YAG slab: $\pm 0.01\text{mm}$
Ends Finish	Surface Figure	$\lambda / 8$	Ends Finish
	Surface Quality	20-10 scratch and dig	10-5 scratch and dig
	Perpendicularity	15'	5'

Anti-Reflective Coating:

Single layer MgF₂ coating with high damage threshold for high power laser operations. Reflectivity R<0.1%@1064nm per surface. Damage threshold over 750MW/cm²@1064nm, 10ns and 10Hz.

High-Reflective Coating:

CASIX offers standard HR coatings with R>99.8%@1064nm and R<5%@808nm, as well as HR coatings such as HR@1064/532nm, HR@946nm, HR1319nm and other wavelengths.

Standard Products in Stock:

Standard Nd:YAG laser rods with dimensions of $\phi 3 \times 5\text{mm}$ and $\phi 4 \times 50\text{mm}$ with AR or HR coating for Diode Pumped Solid State Lasers are ready for immediate delivery.

➤ Chromium Doped Yttrium Aluminum Garnet (Cr⁴⁺:YAG) Crystals

Passive Q-Switching is preferred for simplicity of manufacturing and operation, low cost, and reduced system size and weight. Cr⁴⁺: YAG (Y₃Al₅O₁₂) crystals are excellent for passive Q-Switching diode pumped or lamp-pumped Nd: YAG, Nd: YLF, Yb: YAG or other Nd and Yb doped lasers at wavelengths from 1.0 to 1.2mm. Because they are chemically stable, durable, UV resistant, have good thermal conductivity, have a high damage threshold (>500mW/cm²) and ease of operation, they will replace traditional materials such as LIF, organic dye and color centers.

Basic Properties of Cr⁴⁺:YAG

Formula	Cr ⁴⁺ :Y ₃ Al ₅ O ₁₂
Crystal Structure	Cubic Garnet
Dopant Level	0.03 mol% - 0.05 mol%
Hardness	8.5 (Mohs)
Damage Threshold	>500MW/cm ²
Refractive Index	1.82 @1064nm

Capability:

Attribute	Commercial	High Precision
Flatness	$\lambda/4$	$\lambda/10$
Wavefront Distortion	$\lambda/4$	$\lambda/10$
Surface Quality	20-10 scratch and dig	10-5 scratch and dig

AR coatings and HR coatings are also available. The initial transmission (T₀) can be controlled from 10% to 95% according to customer requirements. Standard size Cr⁴⁺:YAG crystals of 3x3mm² with T₀=80% or 90% are in stock and available for immediate delivery.

Preliminary experiments done on CASIX's Cr:YAG crystals show that the pulse width of passively Q-switched lasers can be as short as 9ns for diode pumped Nd:YAG lasers with repetition as high as 10kHz for diode pumped Nd:YVO₄ lasers. Furthermore, an efficient green output @532nm and UV output@355nm and 266nm were generated after a subsequent intra-cavity SHG in KTP for diode pumped and passive Q-switched Nd:YAG and Nd:YVO₄ lasers.

Cr:YAG is also a laser crystal with tunable output from 1.35um to 1.6um. It can generate ultrashort pulse lasers (to fs pulsed) when pumped by Nd:YAG lasers at 1.064um.

Note: When ordering Cr⁴⁺:YAG crystals, please specify the aperture, initial transmission (T₀) and coatings.

➤ Diffusion Bonding Crystals

CASIX can supply the diffusion bonding crystals now. They are crystals consisting of two, three or more parts with different dopant levels or different dopant. Usually, one laser crystal and one or two undoped crystals combined by optical contact and further bonded under high temperature.

Diffusion Bonding Crystals are used to decrease thermal lensing effect considerably. The bonded crystal used in laser applications can greatly improve the laser performance and beam quality.

Advantage:

- Decrease thermal effect
- Improve efficiency
- Improve beam quality
- Compact size

Main specifications of Diffusion Bonding Crystals:

Type I : Nd:YVO₄+YVO₄

Flatness	$< \lambda/10$
Wavefront distortion	$< \lambda/4$
Parallelism	$\leq 20''$
Perpendicularity	$\leq 15'$
Surface Quality	10/5(MIL-PRF-13830B)
Coating	Upon request of customer



Type II : Nd:YAG +YAG+Cr:YAG

Flatness	$< \lambda/10$
Wavefront distortion	$< \lambda/8$ per inch of length
Parallelism	$\leq 10''$
Perpendicularity	$\leq 10'$
Surface Quality	10/5(MIL-PRF-13830B)
Coating	Upon request of customer



Please contact us for getting more information on the assembly type.

> Potassium Titanyl Phosphate (KTP) Crystals



CASIX's KTP crystals feature high purity, low absorption at fundamental and second harmonic generation wavelengths. We supply super grade and customer-designed KTP crystals for various applications.

Advantages

- Large nonlinear optical (NLO) coefficients
- Wide angular bandwidth and small walk-off angle
- Broad temperature and spectral bandwidths
- High electro-optic (E-O) coefficient and low dielectric constant
- Large figure of merit for an optical waveguide modulator
- Non-hygroscopic, good chemical and mechanical properties

Applications

- Frequency doubling (SHG) of Nd-doped lasers for green/red output
- Frequency mixing (SFM) of Nd lasers and diode lasers for blue output
- Parametric sources (OPG, OPA and OPO) for 0.6mm-4.5mm tunable output
- E-O modulators, optical switches, directional couplers

Capability:

Attribute	Commercial	High Precision
Wavefront distortion	$\lambda/8$	$\lambda/8$
Orientation	$\pm 0.5^\circ$	$\pm 0.2^\circ$
Dimension Tolerance	$\pm 0.1\text{mm}$	$\pm 0.01\text{mm}$
End-faces Configuration	Flat	
Surface Quality	20-10 scratch and dig	0-5 scratch and dig
Flatness	$\lambda/8$	$\lambda/10$
Parallelism	20"	10"
Intrinsic Loss	50ppm cm^{-1} @1064nm	

Additional KTP crystals and coating specifications are available upon request.

> Lithium Triborate (LBO) Crystals

LBO(LiB₃O₅) is an excellent nonlinear optical crystal. It's phase matchable for the SHG and THG of Nd:YAG and Nd:YLF lasers, using either type I or type II interaction. LBO is a nonlinear optical crystal perfectly suited for harmonic generation as well as sum frequency mixing and OPO applications using widely spread Nd lasers, Ti:Sapphire and Dye lasers. Such physical LBO properties as excellent optical homogeneity, non hygroscopicity and very high damage threshold assure long and stable operation of crystal. LBO crystal is the first choice as harmonic generator of high peak power pulsed lasers.

Basic Properties:

Crystal Structure	Orthorhombic, Space group Pna21 Point group mm ²
Lattice Parameters	a = 8.4473Å, a = 7.3788Å, c = 5.1395Å, z = 2
Melting Point	About 8340C
Mohs Hardness	6
Density	2.47g/cm ³
Thermal Conductivity	3.5W/m/K
Thermal Expansion Coefficient	ax = 10.8 x 10 ⁻⁵ /K av = -8.8 x 10 ⁻⁵ /K az = 3.4 x 10 ⁻⁵ /K

Optical Properties:

Transparency Range	160-2600nm
SHG Phase Matchable Range	551-2600nm(Type I) 790-2150(Type II)
Refractive Indices	1.0642mm nx=1.5656, nv=1.5905, ne=1.6055 0.5321mm nx=1.5785, nv=1.6065, ne=1.6212 0.2660mm nx=1.5973, nv=1.6286, ne=1.6444
Therm-Optic Coefficient(°C, λ in μm)	dnx/dT=-9.3X10 ⁻⁶ dny/dT=-13.6X10 ⁻⁶ dnz/dT=(-6.3-2.1λ)X10 ⁻⁶
Absorption Coefficient	<0.1%/cm at 1664nm <0.3%/cm at 532nm
LBO Coefficients	d _{eff(I)} =d ₃₂ cos φ (Type I in XY plane) d _{eff(I)} =d ₃₁ cos ² θ +d ₃₂ sin ² θ (Type I in XZ plane) d _{eff(II)} =d ₃₁ cos θ (Type II in YZ plane) d _{eff(II)} =d ₃₁ cos ² θ +d ₃₂ sin ² θ (Type II in XZ plane)
Non-vanished LBO susceptibilities	d ₃₁ =1.05 ± 0.09 pm/V d ₃₂ = -0.98 ± 0.09 pm/V d ₃₃ =0.05 ± 0.006 pm/V
Sellmeier Equations (λ in μm)	nx ² =2.454140+0.011249/(λ ² -0.011350)-0.014591λ ² -6.60x10 ⁻⁵ λ ⁴ ny ² =2.539070+0.012711/(λ ² -0.012523)-0.018540λ ² +2.0x10 ⁻⁴ λ ⁴ nz ² =2.586179+0.013099/(λ ² -0.011893)-0.017968λ ² -2.26x10 ⁻⁴ λ ⁴

Capability:

• **Optical:**

Attribute	Commercial	High Precision
Dimensions	30x30x30mm, 60mm	
Wavefront Distortion	$\lambda/8$	$\lambda/8$
Orientation	$\pm 0.25^\circ$	$\pm 0.2^\circ$
End-faces Configuration	Flat	
Dimension Tolerance	$\pm 0.1\text{mm}$	$\pm 0.01\text{mm}$
Surface Quality	10-5 scratch and dig	10-5 scratch and dig
Flatness	$\lambda/8$	$\lambda/10$
Parallelism	20"	10"
Perpendicularity	15'	5'
Intrinsic Loss	Less than 0.1%/cm at 1064nm	

• **Coating:**

- > DBAR, Nd:YAG Laser
- > Lower reflection, R<0.2% at 1064nm, R<0.5% at 532nm
- > High damage threshold, >500MW/cm² at both wavelengths 1064nm and 532nm
- > High efficiency
- > BBAR, Tunable Laser
- > Customer designed coating

➤ Barium Borate (BBO) Crystals

CASIX offers high grade Czochralski (CZ) grown BBO crystals with good homogeneity, low defects and low absorption.



CASIX's BBO Crystals Feature:

- Broad phase-matchable second-harmonic-generation (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°C (for type I SHG 1064nm)
- Good mechanical and physical properties

CASIX's BBO Crystals Have Been Applied to:

- Second, third, fourth and fifth harmonic generation of Nd: lasers
- Frequency-doubling, -tripling and -mixing of dye lasers
- Optical parametric amplifiers (OPA) and optical parametric oscillators (OPO)
- Frequency-doubling and -tripling of ultrashort pulse Ti: sapphire and dye lasers
- Frequency-doubling of Argon ions, Cu vapor and ruby lasers
- External intra-cavity SHG

Capability:

Attribute	Commercial	High Precision
Dimensions	L=0.3mm to 25mm Size: Up to 15x15x15 mm ³	
Wavefront Distortion	$\lambda/8$	$\lambda/8$
Orientation	$\pm 0.5^\circ$	$\pm 0.2^\circ$
End-faces Configuration	Flat	
Dimension Tolerance	$\pm 0.1\text{mm}$	$\pm 0.01\text{mm}$
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
Flatness	$\lambda/8$	$\lambda/8$
Parallelism	20"	10"
Perpendicularity	15'	5'

Protective coating is strongly recommended due to high hygroscopic susceptibility of BBO crystals.

> Lithium Niobate (LiNbO₃) Crystals

LiNbO₃ crystals are widely used as frequency doublers for wavelengths >1mm and optical parametric oscillators (OPOs) pumped at 1064 nm as well as quasi-phase-matched (OPM) devices. Due to their large Electro-Optic (E-O) and Acousto-Optic (A-O) coefficients, LiNbO₃ crystals are the most commonly used material for Pockel cells, Q-switches and phase modulators, waveguide substrates, surface acoustic wave (SAW) wafers, etc.

Casix provides high quality, large LiNbO₃ crystals for laser frequency doublers, OPOs and quasi-phase-matched doublers, waveguide substrates and SAW wafers. High quality LiNbO₃ components with apertures of (2-15) x (2-15) mm² and lengths up to 50 mm for frequency doublers, OPOs 50x50x1mm² LiNbO₃ substrates for waveguide optics and 3" diameter SAW wafers are available in high volumes at low prices.

Casix provides high quality MgO: LiNbO₃ crystals for various nonlinear optics (NLO) and E-O applications. The typical size of MgO: LiNbO₃ crystals is (3-10) x (3-10) x (10-30) mm³ for OPOs and OPAs and frequency doubling and mixing, and 20 x 20 x 1 mm³ for waveguide substrates. Other specifications and AR coatings for MgO: LiNbO₃ are available upon request.

Capability:

Attribute	Commercial	High Precision
Wavefront Distortion	λ /4	λ /8
Orientation	±0.5°	±0.2°
End-faces Configuration	Flat	
Dimension Tolerance	±0.1mm	±0.01mm
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
Flatness	λ /8	λ /10
Parallelism	20"	20"
Perpendicularity	15'	5'

Additional LiNbO₃ crystals and coating specifications are available upon request.

> Barium Borate (α -BBO) Crystals

High temperature form BBO (α -BaB₂O₄) are negative uniaxial crystals. They have large birefringence over a broad transparent range of 190nm to 3500nm. CASIX succeeded in growing these crystals to large sizes. The physical, chemical, thermal and optical properties of α -BBO crystals are similar to those of β -BBO. However, the nonlinear optical properties of α -BBO crystals are nonexistent due to the centric symmetry with its crystal structure. α -BBO crystals are not recommended for NLO processes.

α -BBO are excellent crystals to replace Calcite, TiO₂, LiBbO₃, etc. in Glan Taylor and Glan Thompson polarizers as well as walk-off beamsplitters, especially for high power and UV polarizers. This is due to their unique UV transparency, good mechanical properties and high damage threshold. CASIX also manufactures and supplies Glan Laser, Glan Taylor, Glan Thompson polarizers and other beam displacers from high quality α -BBO crystals to replace Calcites in many applications, especially in UV and high power operations.



Basic Properties of α -BBO Crystals

Transparency Range: 190 - 3500nm, see transparency curve

Density: 3.85g/cm³

Therm-Optic Coefficients: dn_o/dT = -9.3 × 10⁻⁶/°C
dn_e/dT = -9.3 × 10⁻⁶/°C

Damage Threshold: @1064nm 1GW/cm²
@355nm 500MW/cm²

Optical Homogeneity: Δn ~ 10⁻⁶/cm²

Mohs Hardness: 4.5

Hygroscopic Susceptibility: Low

Thermal Expansion Coefficients (in the range of 25°C - 900°C):

a₁₁ = 4 × 10⁻⁶/°K a_c = 36 × 10⁻⁶/°K

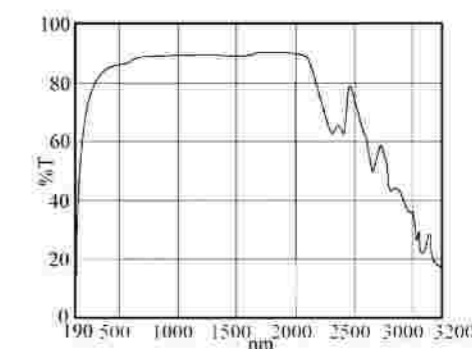
Linear Absorption Coefficients: α < 0.005cm⁻¹ from 300nm to 2300nm

Refractive Indices, Birefringence (Δn = n_e - n_o) and Walk-off Angle at 45° (ρ):

@1.0642 μ m n_e=1.5379 n_o=1.6579 Δn=-0.1199 ρ=-4.287°

@0.5321 μ m n_e=1.5534 n_o=1.6776 Δn=-0.1241 ρ=-4.387°

@0.2660 μ m n_e=1.6114 n_o=1.7617 Δn=-0.1503 ρ=-5.082°



Transparency Curve of α -BBO

Capability:

Attribute	Commercial	High Precision
Surface Quality	60-40 scratch and dig	20-10 scratch and dig
Optical Axis Orientation	±0.5°	±0.2°
Flatness	λ /4	λ /10
Wavefront Distortion	λ /4	λ /8
AR Coating	R<0.5% (narrow band wavelength)	

> Calcite Crystals

Calcite is a negative uniaxial crystal that has high birefringence, wide spectral transmission and availability in reasonably sized rhombs. Although a fairly soft crystal and easily scratched, Calcite is an ideal material for use as visible wavelengths and near IR polarizers such as Glan Taylor, Glan Thompson and Glan Laser.

CASIX carefully selects the raw Calcites crystals by inspecting them with a CW green laser beam. We have perfected a number of proprietary processes for cutting, grinding and polishing good quality optical surfaces for Calcite prisms. These skills are evident in the high quality of our finished components, and enable CASIX polarizers to be used with very high peak power lasers.

Basic Properties of Calcite Crystals

Transparency Range: 350nm-2300nm

Particle Shape: Crystalline Rhombihedral

Density: 2.7g/cm³

Hygroscopic Susceptibility:

Low susceptibility to moisture

Mohs Hardness: 3

Thermal Expansion Coefficient:

$$\alpha_a = 24.39 \times 10^{-6}/^\circ\text{K}; \alpha_c = 5.68 \times 10^{-6}/^\circ\text{K}$$

Crystal Class:

Negative uniaxial with $n_o = n_a = n_b, n_e = n_c$

Refractive Indices, Birefringence ($\Delta n = n_e - n_o$) and Walk-off Angle at 45° (ρ):

$$n_o = 1.6557, n_e = 1.4852, \Delta n = -0.1705, \rho = 6.20^\circ \text{ @ } 0.63 \mu\text{m}$$

$$n_o = 1.6629, n_e = 1.4885, \Delta n = -0.1744, \rho = 6.32^\circ \text{ @ } 1.30 \mu\text{m}$$

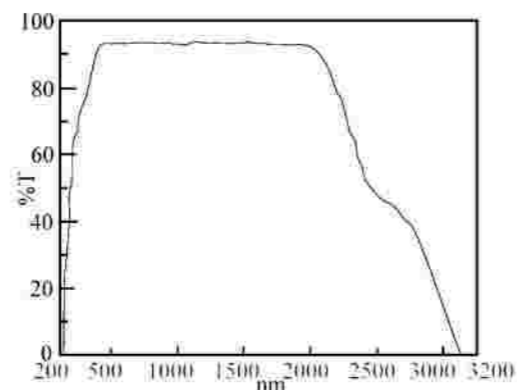
Sellmeier Equation (λ in μm):

$$n_o^2 = 2.69705 + 0.0192064/(\lambda^2 - 0.01820) - 0.0151624 \lambda^2$$

$$n_e^2 = 2.18438 + 0.0087309/(\lambda^2 - 0.01018) - 0.0024411 \lambda^2$$

Capability:

Attribute	Commercial	High Precision
Surface Quality	60-40 scratch and dig	20-10 scratch and dig
Dimension Tolerance	±0.1mm	±0.05mm
Optical Axis Orientation	±0.5°	±0.2°
Flatness	λ/4	λ/10
Wavefront Distortion	λ/4	λ/8
AR Coating	R<0.5%(narrow band wavelength)	



Transparency Curve of Calcite

> Silicon (Si) Crystals

Silicon (Si) is commonly used as a substrate material for infrared reflectors and windows in the 1.5 μm -8 μm region. The strong absorption band at 9 μm makes it unsuitable for CO₂ laser transmission applications but it is frequently used for laser mirrors because of its high thermal conductivity and low density. Silicon is also a useful transmitter in 20 μm range.

Silicon (Si) is the most abundant electropositive element in the Earth's crust. It's a metalloid with a marked metallic luster and very brittle. It is usually tetravalent in its compounds, although sometimes they are bivalent and purely electropositive in its chemical behaviour. Moreover, pentacoordinated and hexacoordinated silicon compounds are also known.

Silicon lenses are popular for many applications in the IR. They are typically used for imaging applications in the 3-5 μm region of the spectrum, making them excellent for security and military applications. They can also be used to collimate infrared lasers. These lenses are coated with a BBAR coating that provides 98% transmission in the 3-5 μm spectral range.

Material Properties:

Material Type	CZ, FZ; N or P
Crystal Direction	{100} {111}
Resistivity (Ohm/cm)	0.003-50
thermal conductivity (J/k .m. s)	163.3 @ 273K
Density (g /cm ³)	2.33 g.cm ⁻³ at 20 °C
Melting point	1410 °C
Boiling point	3265 °C
Knoop Hardness (kg/mm ²)	1150
Transparency Range	1000nm-10000nm 30000nm-300000nm

CASIX can provide different dimension prism, window, mirror, wedge and lens at present.

Plano product Capability:

Attribute	Commercial	High Precision
End-faces Configuration	Flat	
Dimension Tolerance	±0.1mm	±0.01mm
Surface Quality	40-20 scratch and dig	10-5 scratch and dig
Flatness	λ/4	λ/10
Parallelism	20"	2"
Perpendicularity	15'	5'

Plano product Detail specs:

Type	Polishing Area	Roughness
Thick plate	≤5x5mm	1nm
	5x5 - 8x8mm	1nm
	8x8 - φ 38mm	1nm
Prism	≤20x20mm	1nm
Thin plate	≤5x5mm	1nm
	5x5 - 8x8mm	1nm
	8x8 - ≤ φ 38mm	1nm

Lens Specification:

Diameter size -----5-50mm
 Shape: ----- Plano-convex, Double-convex, Plano-concave & Double-concave
 Surface Figure: Power(N)-----≤3
 Irregularity(ΔN) -----≤0.5
 Centration: -----Z>0.15: C≤3'
 -----Z=0.1-0.15: C≤30'
 -----Z<0.1: No centration

$(Z = \frac{D_1 \pm D_2}{R_1 \pm R_2})$, Double-convex and Double-concave lens: "+", Meniscus len: "-", Plano-convex and Plano-concave: R=∞)

Surface quality: -----40-20 scratch and dig, 5 ≤ φ ≤ 22mm
 -----60-40 scratch and dig, 22 ≤ φ ≤ 50mm

> Germanium (Ge) Crystals

Germanium (Ge) is used widely for lenses and windows in thermal imaging and FLIR applications. Its high index of refraction makes it of particular interest. Useful transmission range of Germanium windows is from 2 to 12 μm. Germanium is opaque in the visible.

Germanium has the property of thermal runaway, meaning that the transmission decreases as temperature increases. As such, Ge window should be used at temperatures below 100°C. The higher Knoop Hardness of Germanium (780) makes it ideal for IR applications requiring rugged optics. Germanium's high density (5.33g/cm³) should be considered when designing for weight-sensitive systems.

Material Properties:

Material Type	N or P
Resistivity (Ohm/cm)	4-50
thermal conductivity (J/k .m. s)	58.61 @ 293K
Thermal Expansion Coefficients (1/°C)	6.1x10-6 @298K
Density(g /cm ³)	5.33
Knoop Hardness (kg/mm ²)	780
Absorption Coefficient	3x10-2 @ 10600nm

CASIX can provide different dimension window, mirror and wedge at present.

Capability:

Attribute	Commercial	High Precision
End-faces Configuration	Flat	
Dimension Tolerance	±0.1mm	±0.01mm
Surface Quality	40-20 scratch and dig	10-5 scratch and dig
Flatness	λ /4	λ /10
Parallelism	20"	2"
Perpendicularity	15'	5'

Detail specs:

Type	Polishing Area	Roughness
Thick plate	≤5x5mm	1nm
	5x5 - 8x8mm	1nm
	8x8 - φ 38mm	1nm
Thin plate	≤5x5mm	1nm
	5x5 - 8x8mm	1nm
	8x8 - ≤ φ 38mm	1nm

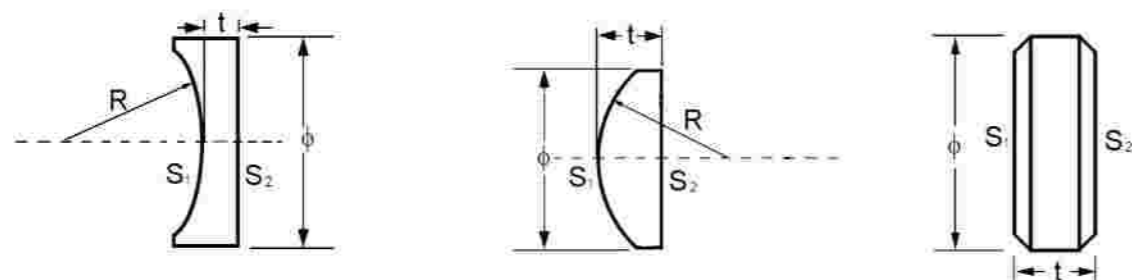
> Laser Optics

Various types of mirrors are available, ranging from laser line mirrors, harmonic separator mirrors, high reflection (HR) mirrors, partial reflection mirrors and metallic coated mirrors.

HR Mirrors

Capability:

Attribute	Commercial	High Precision
Substrate Material	BK7, Fused Silica	
Diameter Tolerance	+0.0, -0.2mm	+0.0, -0.1mm
Clear Aperture	>80%	
Surface Quality	60-40 scratch and dig	20-10 scratch and dig
Surface Irregularity	$\lambda/4$ per 25mm@632.8nm	$\lambda/8$ per 25mm@632.8nm
Parallelism for Plano-flat of Mirror	<1 arc minute	
Coating	HR on S1: R>99.5% for random polarization Uncoated on S2	Custom require



Output Couplers

Capability:

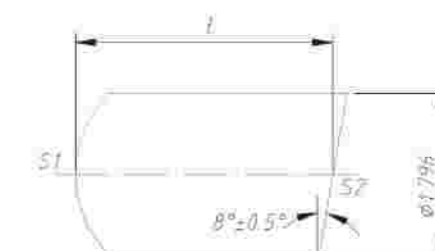
Attribute	Commercial	High Precision
Substrate Material	Schott N-BK7, Chengdu H-K9L	
Diameter Tolerance	0.0, -0.2mm	+0.0, -0.05mm
Thickness Tolerance	± 0.2 mm	± 0.05 mm
Clear Aperture	>80%	>90%
Surface Quality	40-20 scratch and dig	20-10 scratch and dig
Surface Irregularity	$< \lambda/4$	$< \lambda/8$
Parallelism for Plano-flat	$< 3'$	$< 1'$
Coating	PR on S1: R $\pm 2\%$ for R<95%, R $\pm 1\%$ for R>95% AR on S2: R<0.2%	PR on S1: R $\pm 1\%$ for R<95%, R $\pm 0.5\%$ for R>95% AR on S2: R<0.1%

> Telecom Optics



C-Lens

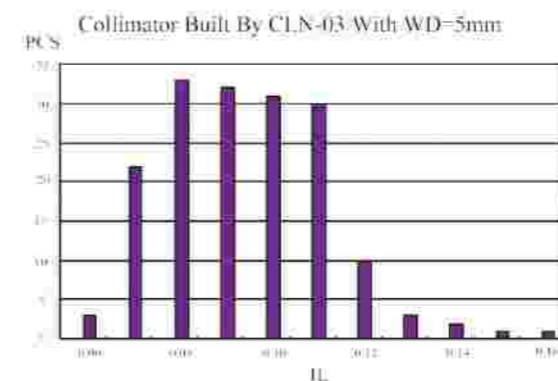
A C-lens has the function as a GRIN-lens. It can be used for a wide range of applications such as fiber collimators, isolators and circulators.



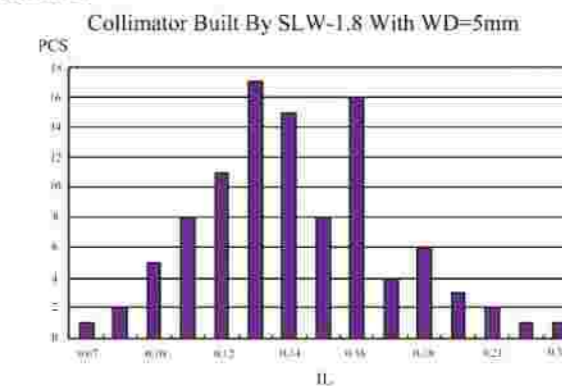
Capability:

Attribute	Commercial	High Precision
Substrate Material	SF11, N-SF11	
Diameter	1.0, 1.8	
Diameter Tolerance	+0.005, -0.01mm	+0, -0.01mm
Length Tolerance	± 0.04 mm	± 0.02 mm
Wedge Angle	0°, 3.7°, 5°, 6°, 7°, 8°	
Clear Aperture	80%	90%
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
Surface Irregularity	$\lambda/4$	
Coating	AR R<0.25%@ $\lambda c \pm 40$ nm, $\lambda c = 1310, 1550$ nm...	AR R<0.20%@ $\lambda c \pm 40$ nm, $\lambda c = 1310, 1550$ nm...

Comparison between C-collimator and G-collimator



Total amount of samples = 168pcs
Mean IL = 0.094dB
Standard deviation of the measure IL = 0.018



Total amount of samples = 100pcs
Mean IL = 0.143dB
Standard deviation of the measure IL = 0.032

C-lens collimators show better insertion loss and better consistency when compared with GRIN-lens collimators.

> Surveying Optics

We offer a wide range of optical components for surveying measurement system applications. Products include light house window assemblies, penta prisms, beam splitting penta prisms, lenses and corner cube prisms. Special prisms and optical components can be made according to customer specifications.

Beamsplitter Penta Prisms

Capability:

Attribute	Commercial	High Precision
Material	BK7 Grade A optical glass	
Dimension Tolerance	±0.2mm	±0.1mm
90° Deviation Tolerance	<30 arc seconds	<2 arc seconds
180° Deviation Tolerance	<20 arc seconds	<5 arc seconds
Flatness Precision Series	< λ /4 at 632.8 nm	< λ /8 at 632.8 nm
Reflectivity	R>95%@630-680nm	R>99.5%@630-680
Surface Quality	60-40 scratch and dig	40-20 scratch and dig
Beamsplitter Ratio Transmission/Reflection	T/R=20/80+/-5%@630-680nm	Specify



Light House Windows

Capability:

Attribute	Commercial	High Precision
Substrate Material	Float Glass	
Dimension Tolerance	±0.25mm	±0.12mm
Angle Tolerance	±0.5°	±0.2°
Surface Quality	60-40 scratch and dig	40-20 scratch and dig
Wavefront Distortion	< λ /4 at 632.8nm per φ 14.3mm	< λ /8 at 632.8nm per φ 14.3mm
Parallelism for Plano-flat of Mirror	y ≤ 3"	y ≤ 1.5"
Coating	T ≥ 90% @ 635~785nm at 0° incident; T ≥ 80% @ 635~785nm with less than ≤ 45° incident	T ≥ 96% @ 635~785nm at 0° incident; T ≥ 90% @ 635~785nm with less than ≤ 45° incident



Corner Cube Retro-reflectors



Capability:

Attribute	Commercial	High Precision
Typical material	BK7, Fused Silica and Other Optic Glass	
Typical dimension (φ × h)(mm)	10 × 7.5, 12.7 × 9.5, 25.4 × 19, 138 × 28.5, 50.8 × 37.5mm	10 × 7.5, 12.7 × 9.5, 25.4 × 19, 38 × 28.5, 50.8 × 37.5mm
Dimension(φ)tolerance	+0.0, -0.2mm	+0.0, -0.1mm
Dimension(h)tolerance	±0.3mm	±0.15mm
Clear aperture	>85%	>90%
Deviation	<5"	<3"
Surface quality	60-40 scratch and dig (≤25.4 × 19mm) 80-50 scratch and dig (>25.4 × 19mm)	40-20 scratch and dig (≤25.4 × 19mm) 60-40 scratch and dig (>25.4 × 19mm)
Wavefront distortion	λ /2 @ 632.8nm (≤25.4 × 19mm) λ @ 632.8nm (>25.4 × 19mm)	λ /4 @ 632.8nm (>25.4 × 19mm) λ /2 @ 632.8nm (>25.4 × 19mm)
Protective bevel	0.1-0.3mm for φ 10- φ 25.4mm	0.05-0.2mm for φ 10- φ 25.4mm

Display Optics

CASIX offers various optical components for display system applications. Products include polarizing beamsplitters, light pipes, RGB Cube and IR filter and so on. Special prisms and optics can be made according to customer specifications.

Polarizing Beamsplitters

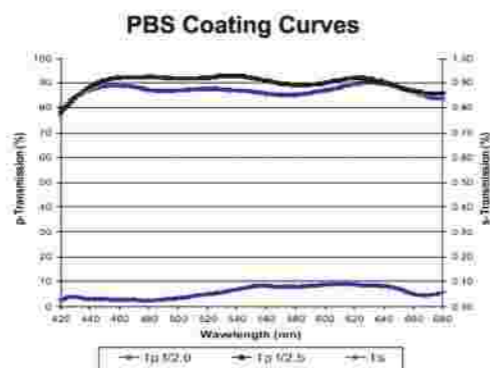


Figure 1 Typical performance of an High Extinction Ratio PBS made with SF17HHT glass

Capability:

Attribute	Commercial	High Precision
Material	BK7 Grade A optical glass	
Size Available	1x1x1 ~ 50.8x50.8x50.8mm	
Dimension Tolerance	±0.2mm	±0.1mm
Surface Quality	60-40 scratch and dig	20-10 scratch and dig
Surface Flatness	< λ /4 at 632.8 nm	< λ /10 at 632.8 nm
PBS Coating on Hypotenuse	PBS:Tp>95%,Ts<1%@Single wavelength, 45D(ext. ratio>100:1);	PBS:Tp>95%,Ts<0.1%@Single wavelength, 45D(ext. ratio>100:1);
Anti-Reflective Coatings	AR:R<0.25%@Single wavelength,0D	AR:R<0.1%@Single wavelength,0D

Light Pipes

Solid rod light pipes are used in projection systems, such as large screen rear projection TVs, and front projectors for business conference room or home theater applications.

Our solid rod light pipes provide highly uniform illumination of the microdisplay, even though the light source may be non-uniform. Key functional characteristics of light pipes include transmission efficiency, angular and dimensional accuracy, and overall workmanship.

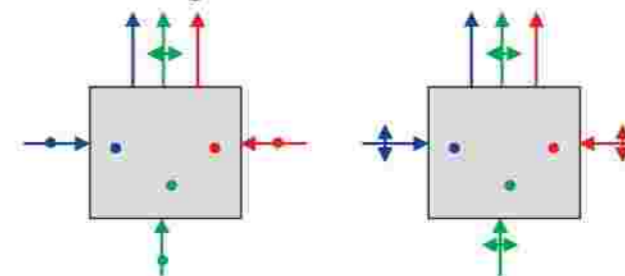


Capability:

Attribute	Commercial	High Precision
material	BK7 Grade A optical glass	
Dimension Tolerance	±0.2mm	±0.05mm
Surface Quality	80-50 scratch and dig	60-40 scratch and dig
Clear Aperture	100%	100%
Edge Chip	<0.1mm	<0.05mm
Parallelism	<3 arc minutes	<1 arc minute
Coating	R<0.5%@420-680nm, 0 degree incident	

RGB Combiner

RGB combiner is to combine the three fundamental colors (Red, Green and Blue) to produce the desired visible color output through the proper modulate (such as LCD, LCOS). It could be potentially used in Display projection, Laser TV, Mobile Projection. We have RGB combiners for either S- or P- polarization input and with or without cone angle.



Capability:

Characteristic	Units	Specification
Wavelength	nm	440-645 nm
		All incidence beams should be S or P polarization
Red Efficiency (polarized linear)	%	> 95.0 %@ 635-645 nm (or custom wavelength)
Green Efficiency (polarized linear)	%	> 95.0 % @527-533 nm (or custom wavelength)
Blue Efficiency (polarized linear)	%	> 95.0 @440-450 nm (or custom wavelength)
Size of cube	mm	>1.5 x 1.5 x 1.5 (+/- 0.1)
Scratch and dig		20/10
AR coating (per surface)	%	R < 0.2 % over wavelength range
Clear Aperture	mm	>=85% per side
Transmitted Wave front error	nm	λ /8
Reflected Wave front error	nm	λ /8
Beam deviation	mrad	< 0.3
Substrate material		BK-7 /SF2 or other suitable material
Color "dot" marking		Refer to the incident surfaces for RGB
Bevel Edges *	mm	Protect chamfer

> Optical Prisms

CASIX provides a broad range of prisms including right angle prisms, penta prisms, dove prisms, roof prisms, anamorphic prisms and wedge prisms.

Penta Prisms

The deviation angle of 90° is independent of the orientation of the prism, making it especially important in applications in which the prism orientation cannot be precisely controlled. Due to a geometry where total internal reflection cannot be used, the reflecting surfaces must be coated with a metallic or dielectric coating. The standard penta prism reflecting surfaces are coated dielectric coating. The coated surfaces can be painted black.

Capability:

Attribute	Commercial	High Precision
Material	BK7 Grade A optical glass	
Dimension Tolerance	±0.2mm	±0.1mm
90° Deviation Tolerance	<30 arc seconds	<2 arc seconds
Flatness	< λ /4 at 632.8 nm	< λ /8 at 632.8 nm
Reflectivity	R>95%@630-680nm	R>99.5%@630-680nm
Surface Quality	60-40 scratch and dig	40-20 scratch and dig

Right-Angle Prisms

A right-angle prism is used as a mirror to deviate light through 90 degrees and also as a retro-reflector to deflect light through 180 degrees by total internal reflection.

90-degree Deflection

90-degree deflection occurs at the face. The hypotenuse image is erected and reversed.

180-degree Deflection

180 degree deflection uses the hypotenuse as the entrance and exit face. The main application is as a retro-reflector provided that the plane of incident beam includes the vertex.

Capability:

Attribute	Commercial	High Precision
Material	BK7, Fused Silica	BK7, Fused Silica
Dimension Tolerance	+0.0,-0.2mm	+0.0,-0.05mm
Clear Aperture	>85%	>85%
Angle Tolerance	≥ ± 30"	± 5"
Flatness	Per 25.4mm λ /4@632.8nm	Per 25.4mm λ /10@632.8nm
Surface Quality	60-40 scratch and dig	20-10 scratch and dig
Protective Bevel	(0.2-0.5) × 45° mm	(0.05-0.2) × 45° mm

Higher flatness products are also available

> Optical Windows

CASIX offers a wide range of materials and degrees of precision windows. Special materials are available upon request.

A broad range of single layer or multilayer antireflective coatings on optical windows are available. Please refer to pages 53-56 for more information on coatings.



BK7 Windows

Capability:

Attribute	Commercial	High Precision
Material	BK7 grade A optical glass	
Diameter Tolerance	+0.0,-0.2mm	+0.0,-0.1mm
Thickness Tolerance	±0.1mm	±0.01mm
Clear Aperture	>80%	>80%
Parallelism	<1 arc minute	<10 arc seconds
Surface Quality	40-20 scratch and dig	20-10 scratch and dig
Wavefront Distortion	λ /4 per 25mm@632.8nm	λ /10 per 25mm@632.8nm
Protective Bevel	0.1-0.5mm	0.05-0.2mm

Fused Silica Windows

Capability:

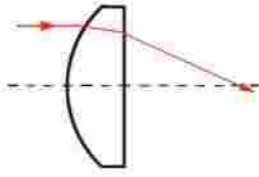
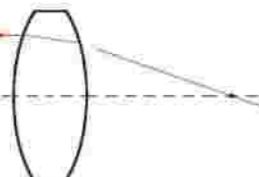
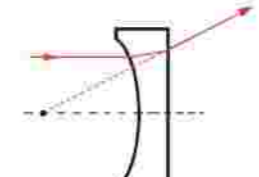
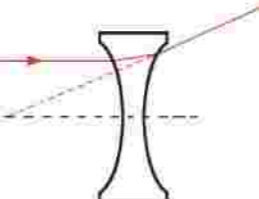
Attribute	Commercial	High Precision
Material	UV grade Fused Silica	UV grade Fused Silica
Diameter Tolerance	+0.0,-0.2mm	+0.0,-0.1mm
Thickness Tolerance	±0.1mm	±0.01mm
Clear Aperture	>80%	>80%
Parallelism	<1 arc minute	<10 arc seconds
Surface Quality	40-20 scratch and dig	20-10 scratch and dig
Wavefront Distortion	λ /4 per 25mm@632.8nm	λ /10 per 25mm@632.8nm
Protective Bevel	0.1-0.5mm	0.05-0.2mm

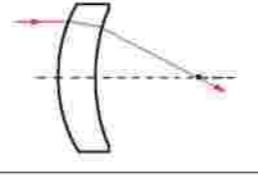
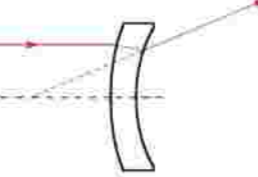
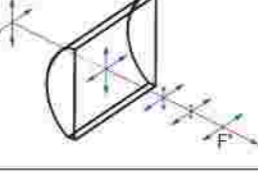
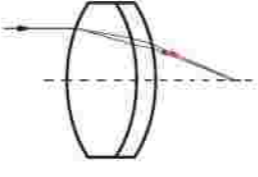

Higher flatness products are also available

Optical Lenses

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.



Lenses	Materials	Illustration	Properties and Applications
Plano-convex	BK7 Fused Silica Sapphire CaF ₂		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	BK7 Fused Silica		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	BK7 Fused Silica Sapphire CaF ₂		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	BK7 Fused Silica		Negative lens with the form most suited to producing diverging light or a virtual image, where the input light is converging.

Lenses	Materials	Illustration	Properties and Applications
Meniscus	Positive BK7		These lenses may be used to increase the numerical aperture of a positive lens assembly, without an undue increase in the aberrations.
	Negative BK7		
Cylindrical	BK7 Fused Silica		Used to provide focusing power in one section only. For illumination or detection of light from line sources. Also used for anamorphic compression of beams and images.
Achromatic	Combinations of Two Optical Grade Glasses		These lenses have considerably reduced values of spherical aberration. Chromatic aberrations. Best used to replace single components where performance must be improved.
Ring Mount for Lenses	Black Anodized Aluminum		Used to fix position of lenses.

Capability:

Attribute	Commercial	High Precision
Material	Schott N-BK7, Chengdu H-K9L, Fused silica, CaF ₂ , Sapphire	
Design Wavelength	546.07nm	
Design Index (BK7)	1.51680 for BK7, 1.45846 for Fused Silica	
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

> Super Small Achromatic Lens



Introduction:

Super small Achromatic Lens for you specific application perform excellent wavefront quality, super small spot size and improved modulation transfer function (MTF).

Feature:

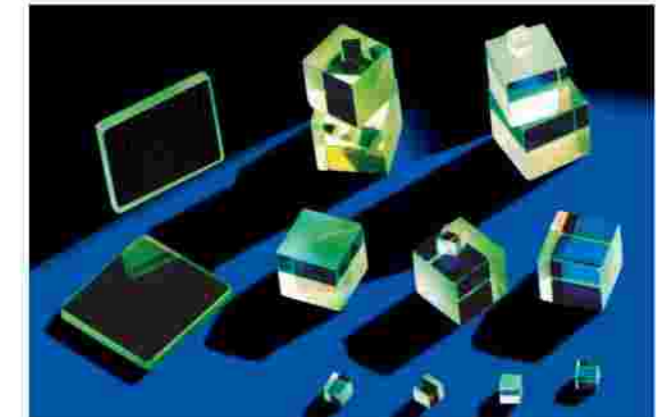
- Small diameter size up to 3mm
- Short focal length, such as 5mm
- Strict quality control, excellent quality
- AR-coating, mounts services

Specifications:

Diameter size	smallest 3 mm
Diameter Tolerance:	+0.0, -0.05mm
Paraxial Focal Length Tolerance:	±2%
Centration:	5 arc minutes
Clear Aperture:	>80%
Surface Figure: Power(N)	<3
Irregularity(N)	<0.5
Surface Quality:	40/20 scratch and dig
Bevel:	< 0.2 mm x 45°
Coating:	Single layer MgF2 broadband AR

> Optical Beamsplitters

Beamsplitters are used to split or combine beams of light. Plates are used for most laser applications as they exhibit low absorption. Cubes are a convenient, protected form for low power applications. The performance of a beamsplitter is mainly dependent on the coating specifications. For the coating curves for each type of beamsplitter, please refer to pages 53-56 on coatings.

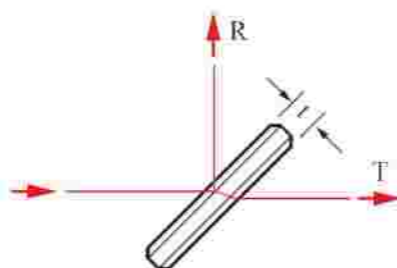


Beamsplitter	Spectrum	Properties
Beamsplitter Plate	Broadband Wavelength	Beamsplitter plates can be used with high power lasers. When using beamsplitter plates, it is important to bear in mind that the two partial beams travel different optical paths. The optical paths depend on the incident angle and the thickness of the plates.
	Single Wavelength	
Beamsplitter Cube	Broadband Wavelength	Compared with beamsplitter plates, beamsplitter cubes have the following advantages: <ul style="list-style-type: none"> • Identical path lengths for both the reflected and the transmitted beams • The transmitted beam is neither displayed nor deflected • Stable and compact • Easy operation • Easy to mount/align
	Single Wavelength	
Penta Beamsplitter Cube	Broadband Wavelength 630-680nm T/R: 20%/80% ±5%	The penta beamsplitter is composed of a penta prism and a wedge. Like the beamsplitter cube, it has the following properties: <ul style="list-style-type: none"> • The transmitted beam is neither displayed nor deflected • Stable and compact • Easy operation
Polarizing Beamsplitter Cube	Broadband Wavelength	The prisms can be used as polarizers, beamsplitters or beam combiners. The output beam, which is parallel to the input beam, is called the p-polarized beam while the orthogonal output beam is defined as the s-polarized beam.
	Single Wavelength	

Beamsplitter Plates

Capability:

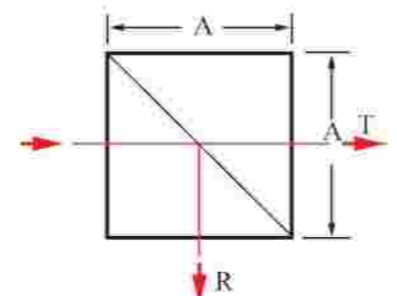
Attribute	Commercial	High Precision
Material	BK7	BK7
Dimension Tolerance	±0.1mm	±0.02mm
Thickness Tolerance	±0.1mm	±0.02mm
Flatness	Per 25.4mm λ /4@632.8nm	Per 25.4mm λ /10@632.8nm
Surface Quality	60-40 scratch and dig	10-5 scratch and dig
Parallelism	<20 arc seconds	<5 arc seconds
T/R	T/R=(Ts+Tp)/2, R=(Rs+Rp)/2 T/R=50/50, 80/20, 70/30, 90/10, 60/40 ±5% @ λ c or λ b	T/R=(Ts+Tp)/2, R=(Rs+Rp)/2 T/R=50/50, 80/20, 70/30, 90/10, 60/40 ±3% @ λ c or λ b
Coating	λ c: Single wavelength, λ b: Broadband wavelength	



Beamsplitter Cubes

Capability:

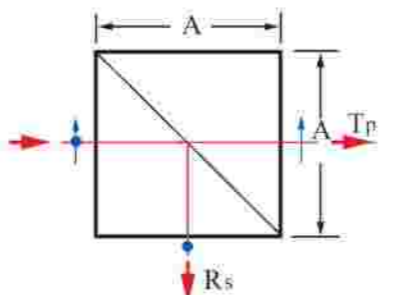
Attribute	Commercial	High Precision
Material	BK7	BK7
Dimension Tolerance	±0.2mm	±0.1mm
Flatness	Per 25.4mm λ /4@632.8nm	Per 25.4mm λ /10@632.8nm
Surface Quality	60-40 scratch and dig	20-10 scratch and dig
T/R	50/50 ±5%	50/50 ±2%
Beam Deviation	<3arc minutes	<30arc seconds
coating	Specified wavelength or T/R	Specified wavelength or T/R



Polarizing Beamsplitter (BPS)

Capability:

Attribute	Commercial	High Precision
Material	BK7,SF2	BK7,SF2
Dimension Tolerance	±0.2mm	±0.1mm
Surface Quality	60-40	20-10
Beam Deviation	<3arc minutes	<30arc seconds
Extinction Ratio	100:1	Specify
Principal Transmittance	Tp>95%, Ts<1%	Specify
Principal Reflectance	Rs>99%, Rp<5%	Specify
Coating	AR on all input and output surface BPS Coating on hypotenuse (broadband wavelength: 450-680, 650-850, 900-1200nm etc)	Specify



Optical Waveplates

Waveplates (retardation plates or phase shifters) are made from materials which exhibit birefringence. The velocities of the extraordinary and ordinary rays through the birefringent material vary inversely with their refractive indices. This difference in velocities gives rise to a phase difference when the two beams recombine. In the case of an incident linearly polarized beam this is given by $\alpha = 2\pi d(n_e - n_o)/\lambda$, where α is phase difference; d is thickness of waveplate; n_e , n_o are refractive indices of extraordinary and ordinary rays respectively; λ is wavelength. At any specific wavelength the phase difference is governed by the thickness of the retarder.



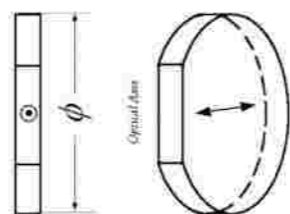
Casix waveplates, including octadic-wave ($\lambda/8$), quarter-wave ($\lambda/4$), half-wave ($\lambda/2$) and full-wave (λ) plates, are widely used in synthesis and analysis of light in various states of polarization. The wavelengths within the range of 240nm~2100nm are all available at CASIX.

Capability:

Attribute	Commercial	High Precision
Material	Crystal Quartz,MgF2	Crystal Quartz,MgF2
Dimension Tolerance	+0, -0.13mm	±0.02mm
Wavefront Distortion	λ /8@632.8nm	λ /20@632.8nm
Retardation Tolerance@23℃	λ /150@632.8nm	λ /500@632.8nm
Wavelength Range	240~2100nm	240~2100nm
Parallelism	3 arc seconds	0.5 arc seconds
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
AR/AR Coating	R<0.2% at central wavelength	R<0.1% at central wavelength

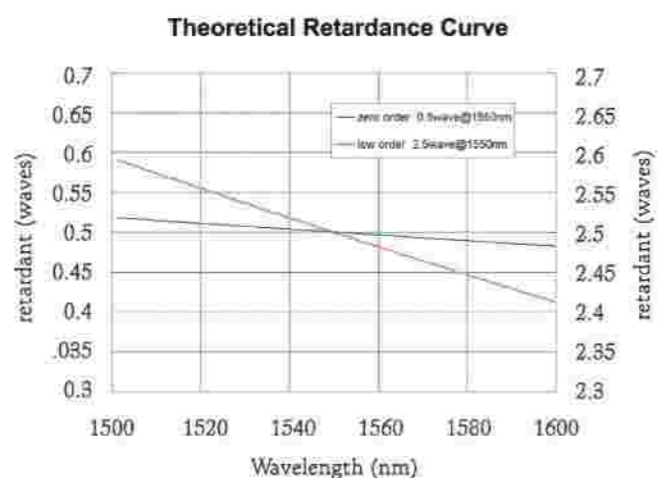
Low-Order Waveplates

- Thickness: 0.2-0.5mm
- High Damage Threshold
- Better Temperature Bandwidth
- Low Cost



Capability:

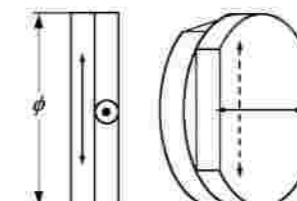
Attribute	Commercial	High Precision
Material	Crystal Quartz, MgF2	Crystal Quartz, MgF2
Dimension Tolerance	+0, -0.13mm	±0.02mm
Wavefront Distortion	$\lambda/8@632.8\text{nm}$	$\lambda/20@632.8\text{nm}$
Retardation Tolerance	$\lambda/120@632.8\text{nm}$	$\lambda/500@632.8\text{nm}$
Wavelength Range	240~2100nm	240~2100nm
Parallelism	3 arc seconds	0.5 arc seconds
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
AR/AR Coating	R<0.2% at central wavelength	R<0.1% at central wavelength



Zero-Order Waveplates

Cemented & Optically Contacted Zero-Order Waveplates

- Double Plates
- Broad Spectral Bandwidth
- Wide Temperature Bandwidth
- AR Coated

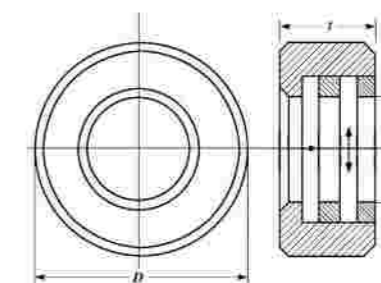


Capability:

Attribute	Commercial	High Precision
Material	Crystal Quartz	Crystal Quartz
Dimension Tolerance	+0, -0.2mm	±0.05mm
Wavefront Distortion	$\lambda/4@632.8\text{nm}$	$\lambda/10@632.8\text{nm}$
Retardation Tolerance	$\lambda/120@632.8\text{nm}$	$\lambda/300@632.8\text{nm}$
Wavelength Range	400~2100nm	240~2100nm
Parallelism (single plate)	3 arc seconds	0.5 arc seconds
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
AR/AR Coating	R<0.2% at central wavelength	R<0.1% at central wavelength

Air-spaced Zero-Order Waveplates

- Double Retardation Plates
- Wide Temperature Bandwidth
- Broad Spectral Bandwidth
- High Damage Threshold
- AR Coated and Mounted



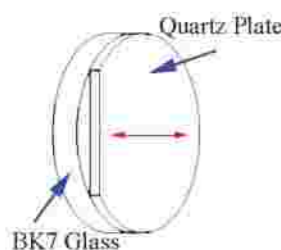
Capability:

Attribute	Commercial	High Precision
Material	Crystal Quartz	Crystal Quartz
Dimension Tolerance	+0, -0.2mm	±0.05mm
Wavefront Distortion	$\lambda/4@632.8\text{nm}$	$\lambda/10@632.8\text{nm}$
Retardation Tolerance	$\lambda/120@632.8\text{nm}$	$\lambda/300@632.8\text{nm}$
Wavelength Range	240~2100nm	240~2100nm
Parallelism(single quartz plate)	3 arc seconds	0.5 arc seconds
Surface Quality	20-10 scratch and dig	10-5 scratch and dig
AR/AR Coating	R<0.2% at central wavelength	R<0.1% at central wavelength

True Zero-Order Waveplates

Capability:

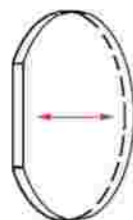
Attribute	Commercial	High Precision
Material	Crystal Quartz, BK7	Crystal Quartz, BK7
Dimension tolerance	+0, -0.13mm	±0.02mm
Wavefront distortion	$\lambda/8@632.8\text{nm}$	$\lambda/20@632.8\text{nm}$
Retardation tolerance	$\lambda/240@632.8\text{nm}$	$\lambda/500@632.8\text{nm}$
Wavelength range	400~2100nm	240~2100nm
Parallelism	3 arc seconds	1 arc seconds
Surface quality	20-10 scratch and dig	10-5 scratch and dig
AR/AR coating	R<0.2% at central wavelength	R<0.1% at central wavelength



Cemented True Zero-Order Waveplates

- Broad spectral bandwidth
- Wide temperature bandwidth
- Wide angle bandwidth
- Cemented by epoxy

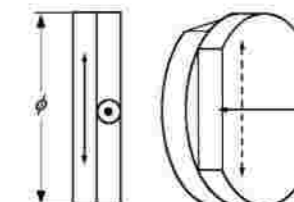
Single Plate True Zero-Order Waveplates



- Broad spectral bandwidth
- Wide temperature bandwidth
- Wide angle bandwidth
- High damage threshold
- Standard wavelength: 1310nm, 1550nm
- $\lambda/2$ waveplate
- Thickness down to 0.028Mm

Achromatic Waveplates

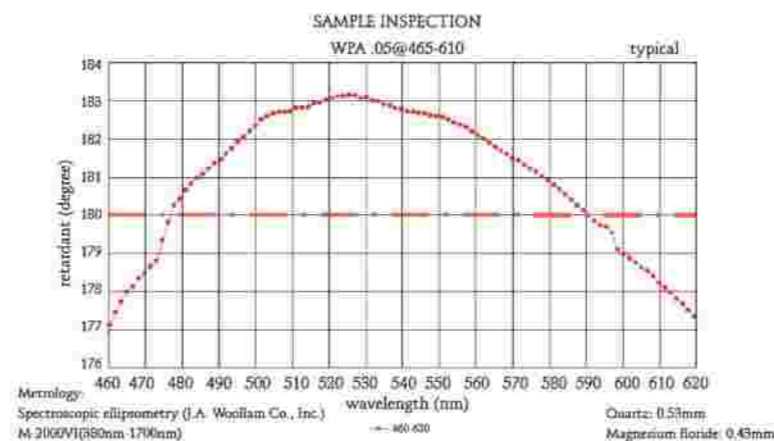
Achromatic waveplates are similar to zero-order except that the two plates are made from different materials, such as crystal quartz and magnesium fluoride. Since the dispersion of the birefringence can be different for the two materials, it is possible to specify the retardation value at a wavelength range. Hence, the retardation of the resulting waveplate can be made to low sensitivity to wavelength change.



Based on the contact methods of the two plates, achromatic waveplates are classified into two types: air-spaced and cemented.

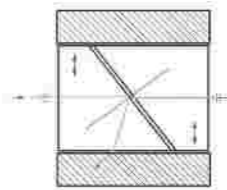
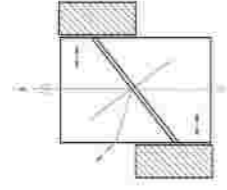
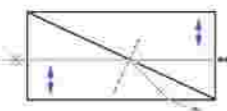
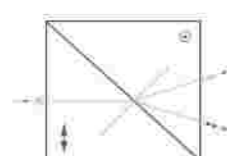
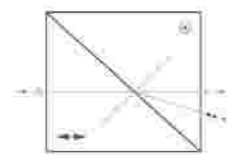
Capability:

Attribute	Commercial	High Precision
Substrate material	Crystal Quartz and MgF2	Crystal Quartz and MgF2
Dimension tolerance	+0, -0.2mm	±0.05mm
Wavefront distortion	$\lambda/4@632.8\text{nm}$	$\lambda/8@632.8\text{nm}$
Retardation tolerance	$\lambda/50@700\text{nm}\sim 1000\text{nm(NIR)}$	$\lambda/100@700\text{nm}\sim 1000\text{nm(NIR)}$
Wavelength range	400~2100nm	400~2100nm
Parallelism (single plate)	3 arc seconds	1 arc seconds
Surface quality	40-20	10-5
Standard wavelength	VIS:465nm~610nm NIR:700nm~1000nm IR:1200nm~1650nm	VIS:465nm~610nm NIR:700nm~1000nm IR:1200nm~1650nm



> Optical Polarizers

A polarizer is an important optical component that is widely used in optics to produce a state of linear polarization. CASIX provides polarizers with three materials, α -BBO, calcite and YVO_4 , making them suitable for the widest spectrum and high polarization purity application.

Polarizer	Material	Illustration	Properties and Applications
Glan Taylor Polarizer	α -BBO (200-3500) Calcite (350-2300) YVO_4 (450-5000)		<ul style="list-style-type: none"> ● Air-spaced ● Cutting angle close to Brewster's angle ● The extraordinary ray passes through with little deviation ● Sealed mount without escape windows is suitable for low to medium power applications where the rejected beam is not required
Glan Laser Polarizer	α -BBO (200-3500) Calcite (350-2300)		<ul style="list-style-type: none"> ● Cutting angle close to Brewster's angle ● Mounted with escape windows, therefore it is suitable for high power applications
Glan Thompson Polarizer	Calcite (350-2300)		<ul style="list-style-type: none"> ● Cemented ● Suitable for low power applications ● Special design for the ratio of L/A (length/aperture) guarantees the wide acceptance angle
Wollaston Polarizer	Calcite (350-2300)		<ul style="list-style-type: none"> ● Cemented ● Both ordinary and extraordinary beams are deviated ● Suitable for low power applications and where a large deviation is required
Rochon Polarizer	α -BBO (190-3500)		<ul style="list-style-type: none"> ● Made by α-BBO material guaranteeing a wide transmission range, especially suited for UV applications ● Split the ordinary and extraordinary ray, but only extraordinary beam is deviated ● Wide wavelength range

> Chemically Activated Direct Bonding Optics

CASIX can supply the new bonding technology now. Using this new technology, we can bond all glass material, Si serial materials without Single SiO_2 coating layer and other material with Single SiO_2 coating layer.



Advantages

- High Tolerance, keep original parallelism of component and difference of flatness less than 0.5λ
- Low loss (less than 0.01dB)
- High temperature endurance
- High Intensity (Shear strength: $>45\text{Kg/cm}^2$, Strength of intension: $>138\text{Kg/cm}^2$)
- Low Stress
- Water Endurability
- Endurability on Isopropyl alcohol, acetone, alcohol and gasoline

Disadvantage:

- Longer curing time.

Please contact us for getting more information on the bonding type

> Pigtail



For a high optical quality fiber ends, coating on the endface, or for accurate mounting in collimator applications, a practical solution is to glue the bare fiber to the core of a glass capillary. This provides a method of easy handling, resulting in a better finish.

Feature:

- High precision dimension control
- High stability and reliability
- Customer design available

Application:

Collimators, Isolators, Switches, WDM, MEMS, Circulators.....

Capability:

Attribute	Commercial	High Precision
Diameter	1.0/1.6/1.8/2.2±0.005mm	
Length tolerance	±0.25mm	±0.1mm
Bore	Single or dual	
Polishing angel	0/6/8/10/12 degree	
Angel tolerance	±0.3 degree	<±0.2 degree
Fiber	Single Mode/Multi Mode/PM	
Coating	R<0.2%@central wavelength (1310nm, 1550nm and so on)	Per customer requirement

> Collimator



Fiber collimators consist of optical fiber tip precisely aligned to a collimating lens which is either a GRIN lens or a C-lens, it collimates beam from fiber, or couples collimated beams into fiber.

Feature:

- Low insertion loss
- High return loss
- Good uniformity
- Epoxy free in optical path
- Compact size

Application:

Isolators, Circulators, Optical Switches, WDM, Signal processing.....

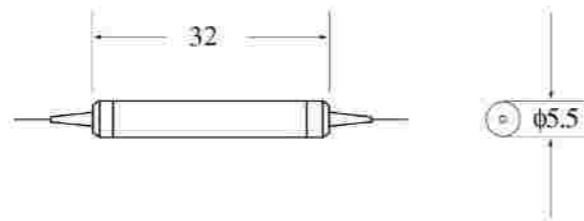
Capability:

Attribute	Commercial						High Precision
	1310, 1550nm						
Center wavelength	1310, 1550nm						
Working distance	≤20mm	≤100mm	≤200mm	≤300mm	≤600mm		
Insertion loss (Max.)	P	A	A	A	A	A	Per requirement
	0.15dB	0.18dB	0.25dB	0.40dB	0.50dB	0.60dB	
Return loss (Min.)	60dB						Per requirement
Optical power	500 mW						
Housing diameter	1.8/2.8mm for glass sleeve						Per requirement

Isolator



CASIX provides high quality single stage, dual stage and PMD compensated optical isolator, including single stage and dual. OEM isolators with different specification are also available.



Features:

- Wide operating wavelength & temperature range
- Low insertion loss & high isolation
- Low PDL & PMD
- Epoxy-free in optical path

Applications:

EDFA, WDM & DWDM systems, fiber optic instruments, transmitters & fiber laser.....

Specifications*:

Parameter	Unit	Single Stage		Dual Stage	
		Grade "P"	Grade "A"	Grade "P"	Grade "A"
Central Wavelength (λ_c)	nm	1310nm & 1550nm			
Peak Isolation	Min dB	42	40	58	55
Isolation ($\lambda_c \pm 15\text{nm}$, 23°C)	Min dB	32**	31	--	--
Isolation ($\lambda_c \pm 30\text{nm}$, 23°C)	Min dB	--	--	46	45
Isolation ($\lambda_c \pm 15\text{nm}$, 0~70°C)	Min dB	22**	20	38	34
Insertion Loss (λ_c , 23°C)	Typ dB	0.30	0.40	0.40	0.60
Insertion Loss ($\lambda_c \pm 15\text{nm}$, 0~70°C)	Max dB	0.40	0.55	0.55	0.70
PDL (λ_c , 23°C)	Max dB	0.05	0.10	0.05	0.10
PMD	Max ps	0.20***	0.20	0.05	0.05
Return Loss (λ_c , 23°C, Input/Output)	Min dB	65/60	60/55	65/60	60/55
Fiber Type	Corning SMF-28e				
Fiber Length	Min m	1.0			
Power Handling	Max mW	1,000			
Operating Temperature	°C	0~70			
Storage Temperature	°C	-40~85			
Package Dimension	mm	$(\phi) 5.5 \times (L) 32$			

* : All SOP, SOP = State of Polarization

** : Isolation is 30dB ($\lambda_c \pm 15\text{nm}$, 23°C) and 21dB ($\lambda_c \pm 15\text{nm}$, 0~70°C) for 1310nm

***: PMD < 0.05ps for single stage PMD compensated isolator.

Etalons

Etalons are narrowband wavelength filters. They offer the advantages of transmission. Because etalons feature low wavefront distortion, low insertion loss, easy tenability etc, they are widely applied in fiber communications such as WDM networks, tunable filter, wavelength locker, DWDM system etc.

An etalon is a very simple device and its theory basis is the interference of multiple beams, it consists of two partially transmitting mirrors that are separated by a distance to form a reflective cavity. When a plane wave incident at angle α as in figure 1 below, the transmission of the etalon is given by the following formula:

$$T(\lambda) = \frac{(1 - A_1 - R_1) \cdot (1 - A_1 - R_1)}{(1 - \sqrt{R_1 \cdot R_2})^2 + 4 \cdot \sqrt{R_1 \cdot R_2} \cdot \sin(\frac{\delta}{2}) \cdot \sin(\frac{\delta}{2})}$$

Here:

A1 and A2 and R1 or R2 are reflective mirror's absorbance and reflectivities:

δ is the internal phase shift per traversal: $\delta = \frac{4 \cdot \pi \cdot n \cdot d \cdot \cos(\theta)}{\lambda}$

n is the cavity refractive index, d is the cavity thickness, λ is the wavelength of incident wave and θ is the inclination of the direction of the coming radiation to the normal of the mirror.

The transmission curve is shown in Figure 2:

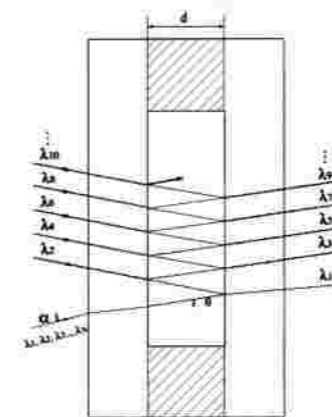
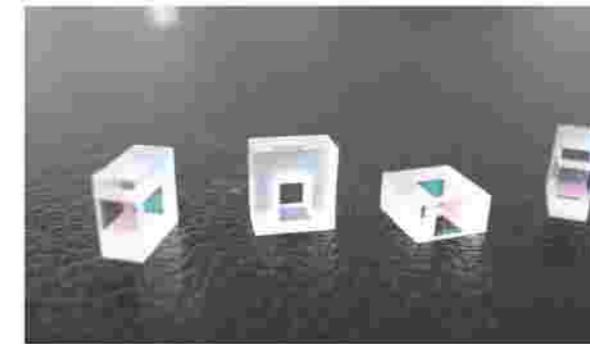


Figure 1: The Device of An Etalon

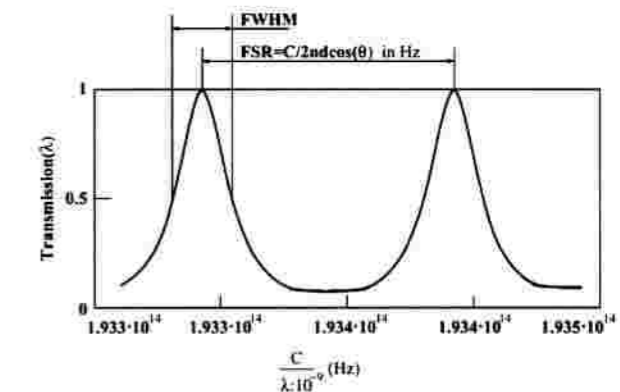


Figure 2: transmission peaks an etalon

The frequency separation between adjacent peaks is termed the free spectral range (FSR). The full width at a half maximum of peaks is termed FWHM. It is given by the following formula:

$$\text{FWHM} = \frac{\text{FSR}}{\text{Finesse}} \quad \text{in Hz}$$

The finesse (F) is given by: $F = \text{Finesse} = \frac{1}{1 - \sqrt{R_1 \cdot R_2}} = \frac{\text{FSR}}{\text{FWHM}}$

The finesse (F) indicates sharp extent of interference stripe, the factor that affects finesse is the reflectivity of the mirrors, surface figure and parallelism.

Total finesse is given by:

$$\frac{1}{\text{Finesse_All}^2} = \frac{1}{\text{Finesse_R}^2} + \frac{1}{\text{Finesse_P}^2}$$

Here finesse_R is decided by reflectivity, Finesse_P is decided by surface and parallelism.

Because FSR is decided by the internal phase shift per traversal δ , we change FSR through tuning δ , according to

$$\delta = \frac{4 \cdot \pi \cdot n \cdot d \cdot \cos(\theta)}{\lambda}$$

The following three ways that we suggest to turn an etalon:

- (1) Angle or tilt-tune the etalon to change θ , the way is widely in tunable filter, wavelength locker etc.
- (2) Change the cavity refractive index and the way is widely used in WDM system etc.
- (3) To tune the optical path length nd through controlling temperature.

We offer two types of etalons for the filter communication; Air-spaced Etalons and Solid Etalons.

Air-spaced Etalons:

Air-spaced etalons are two extremely parallel plates polished to very tight specification with an air gap between them. Using a ULE or fused silica as a gasket that is optically contacted between the two plates creates the air gap. Designed with special partial reflecting etalon coating and AR coatings result in improved transmission. The mechanical design is robust and our etalon has great thermal stability. Our air-spaced etalons are available in a wide range of FSR values from 1500 GHz to 10 GHz.

Solid etalons:

Solid etalon are two parallel plates but with a special coating to create the cavity. High quality cavities result in higher transmission a compact size and lower cost. These etalons have the potential for a high damage threshold and are particularly good for intercavity use. Our solid etalons are available in a wide range of FSR's, from 1500 GHz to 10 GHz.

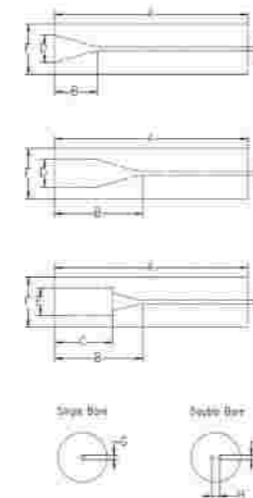
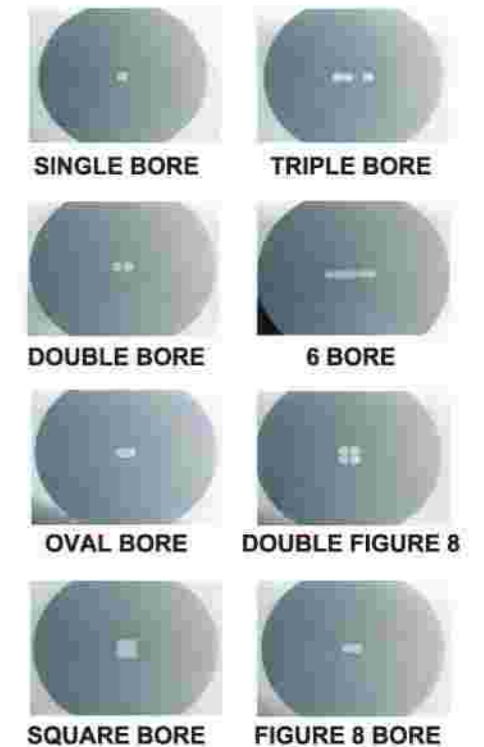
Capability:

Attribute	Commercial		High Precision	
Operating Wavelength	1520-1620nm			
Material	Fused silica, optical-grade silicon, Zerodur			
Typical Free Spectral Range (FSR)	25 GHz / 50 GHz / 100 GHz (Other FSR available)			
FSR Tolerance	25 GHz	±0.0025 GHz	25 GHz	±0.0015 GHz
	50 GHz	±0.005 GHz	50 GHz	±0.003 GHz
	100 GHz	±0.025 GHz	100 GHz	±0.015 GHz
Surface Quality	20-10 scratch and dig		10-5 scratch and dig	
Angle of Incidence	0°			
Single surface Reflectivity	> 90%			
Operating Temperature	User specified			
Diameter D (mm)	1 mm x 1 mm (minimum)			
Typical Lead Time	5-8 weeks			

➤ Ferrules and Sleeves

VitroCom manufactures ultra high quality precision glass ferrules and alignment sleeves for the fiber optic market from borosilicate and clear fused quartz glasses. These custom made ferrules are produced to customer specifications utilizing proprietary technology and processes. We can produce a variety of ID configurations to tolerances of +/-0.001mm in some cases. Just a few of the possibilities are shown on this page. We offer a variety of lead-in configurations as shown below. We can also work with custom designed lead-ins.

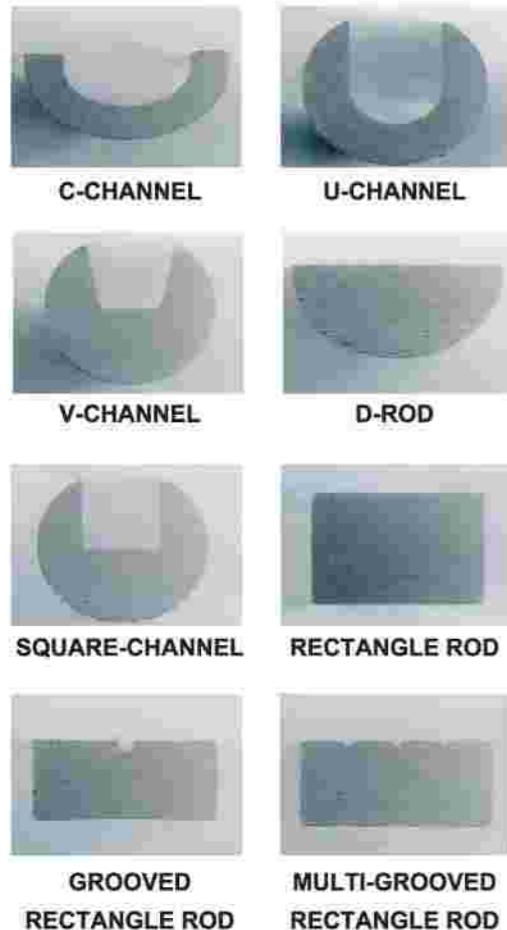
Alignment sleeves are precision drawn products made to customer specifications for aligning ferrules and lenses. Available materials include clear fused quartz glass and various types of Borosilicate glasses and soft glasses. The inner and outer diameters can be held to 0.005mm.



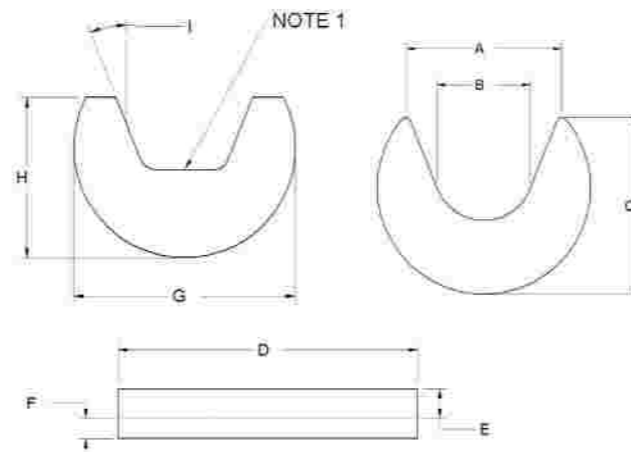
- A=Overall Length ± Tolerance
- B=Lead-in Depth ± Tolerance
- C=Counter Sink Depth ± Tolerance
- D=Lead-in Diameter ± Tolerance
- E=Counter Sink Diameter ± Tolerance
- F=Outer Diameter ± Tolerance
- G=Inner Diameter ± Tolerance
- H= Spacing Distance ± Tolerance

Attribute	Commercial	High Precision
Substrate Material	Borosilicate or clear fused quartz	
Overall Length Tolerance	±0.2mm	±0.05mm
Outer Diameter	0.5, 1.0, 1.6~2.2mm	Some special diameter or square ferrule
Outer Diameter Tolerance	±0.005mm	±0.003mm
Inner Diameter Tolerance	±0.002mm	±0.001mm
Spacing Distance Tolerance	±0.002mm	±0.001mm
Surface of lead-in end	Cutting surface	Fire-treatment surface
Chip on lead-in edge	<0.4x1.0x0.4mm	<0.1x0.4x0.1mm

> Glass Substrates



Custom Clear Fused Quartz glass substrates and components are precision drawn for use in fiber optic application and/or component packaging, and can be manufactured to customer specifications. Typical applications include fused coupler packaging for fiber support and/or alignment purposed, or for isolating fiber within the package. Very tight tolerance are achieved by VitroCom*s proprietary technologies and processes and our expertise in manufacturing non-circular and irregular configurations are shown on this page.



- A=Maximum Width of Groove ± Tolerance
- B=Minimum Width of Groove ± Tolerance
- C=Overall Diameter ± Tolerance
- D=Length of Piece ± Tolerance
- E=Depth of Groove ± Tolerance
- F=Distance between Bottom of Groove
- G=Major Axis of Outer Piece ± Tolerance
- H=Minor Axis of Outer Piece ± Tolerance
- I=Angle Specifications (max. /min)

NOTE 1: Specify shape requirements such as fullradiused, parallel sides, right angle sides, tapered, etc.

Also include:

- Glass Type
- Concentricity Specifications
- Ground and/or Polished Surfaces

Please contact us for a substrate custom quote.

> Coatings

CASIX own many kinds of coaters to supply different coatings. Coating with high surface quality, high damage threshold coating, many types of filters can be supplied by us. At present, we have Veeco coater from USA, Oporum coater from Japan, Leybold coater from Germany, Korea coater and domestic coaters to support us for getting variety of coatings and better quality.

Veeco Coater



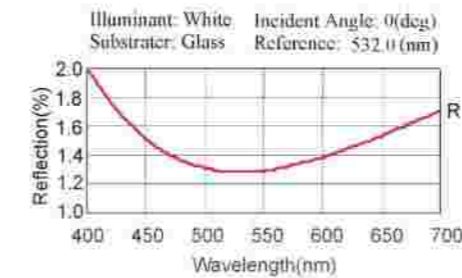
Oporun coater



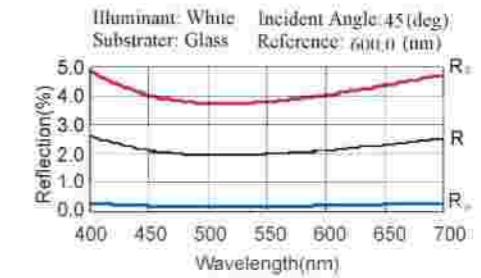
CASIX provides a wide variety of coatings from simple single layer antireflective coatings using MgF₂ and mirror coatings to complex multilayer dielectric stacks. Typical types of dielectric coatings are BBAR, V-coatings and dual wavelength AR coatings.

Coating Type		Properties and Applications
Antireflection	Single Layer MgF ₂	Applied to materials with refractive indices from 1.45 to 2.4. The most popular antireflective coating for visible wavelengths. It is insensitive to change in incidence angles.
	Multilayer "V"	Used to provide low reflectance within a narrow durable wavelength band for most laser applications. Minimum reflection can be less than 0.1%.
	Broadband Multilayer	These coating have excellent performance over a broad special broadband. Coating performance is sensitive to angle of incidence.
	Dual Wavelength Band	Offer very low reflectance at two widely spaced wave lengths, such as Nd: YAG Laser (1064) and its second harmonic (532).
Partial Reflection	Narrow Band	Provide 50% reflection and transmission at an angle of 45° incidence for a single wavelength. Perfect for beamsplitter applications. Transmission/reflection (T/R) ratio of 20/80. Additional T/R ratios for beamsplitter are available upon request.
	Broadband	Provide 50% reflection and transmission over a wide bandwidth. CASIX also provides coating with different R/T ratios and specific angles of incidence.
Beamsplitter	Laser Line Polarizing Beamsplitters	High reflection for s-polarized and antireflection for p-polarized for laser applications.
	Broadband Polarizing Beamsplitters	Wide wavelength bandwidths provide high reflection to s-polarized and antireflection to p-polarized.
	Dichroic Beamsplitter Mirrors	These coatings separate the laser fundamental and the pump wavelength or the fundamental and the second harmonic. They are specifically applied to laser mirrors.
DPSSLasers	Diode Pumped Laser Optics Coating (DPO)	These coatings are designed for a diode pumped laser. They can be deposited on a variety of substrates and have a high damage threshold.
High Reflection	Dielectric High Reflective Coatings	Provide high reflectance over a broad bandwidth and are ideal for tunable lasers or white light applications.
	Metallic High Reflective Coatings	Metallic coating have low peak reflectance, mechanical durability and a high damage threshold, but they have an extremely broad bandwidth and low cost. They are insensitive to angle of incident light and polarization.

Single Layer MgF₂ Antireflective Coatings (SAR)

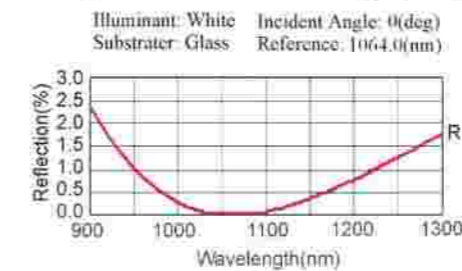


R₀ < 1.5% @ 510nm R < 2% @ 400-700nm

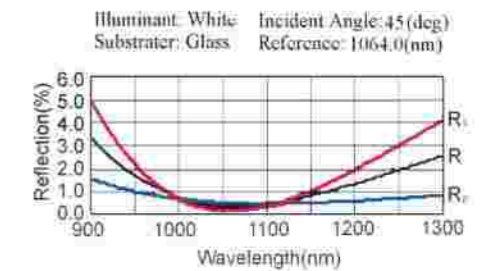


R₀ < 2.0% @ 510nm R < 3.0% @ 400-700nm

Multilayer Antireflective Coatings (VAR)

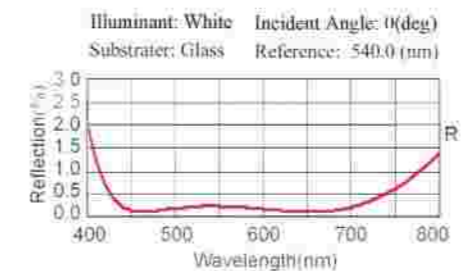


R₀ < 0.2% @ 1064nm

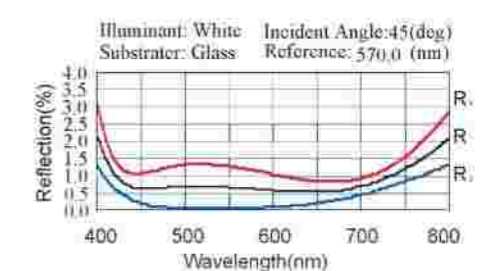


R₀ < 1.0% @ 1064nm

Multilayer Broadband Antireflective Coatings (WAR)

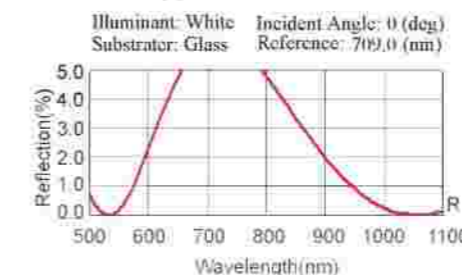


R < 0.6% @ 450-650nm R < 1.0% @ 420-700nm

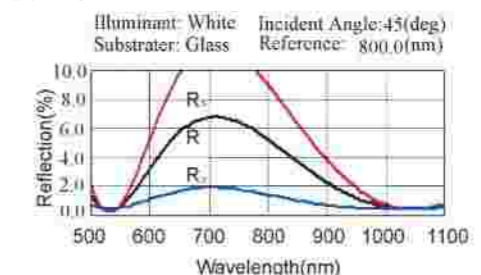


R < 1.0% @ 450-650nm

Dual Wavelength Band Antireflective Coatings (DAR)

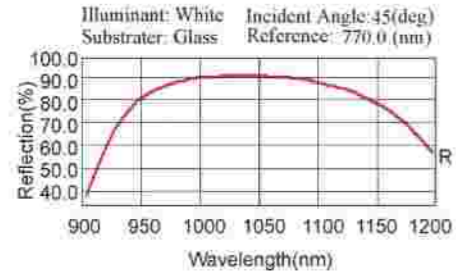


R₀ < 0.25% @ 1064nm R₀ < 0.5% @ 532nm

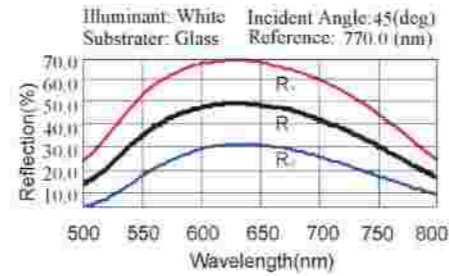


R < 1.0% @ 1064nm R < 1.0% @ 532nm

Single Wavelength Band Partial Reflective Coatings (SPR)

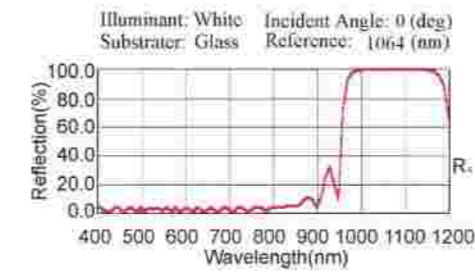


$R_0 = 90\% \pm 2.0\% @ 1064\text{nm}$

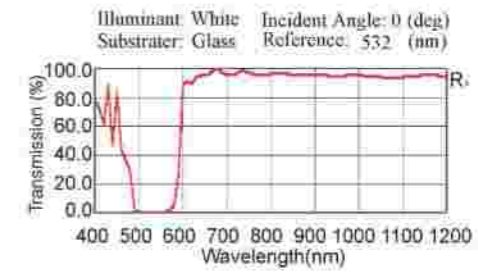


$R_0 = 50.0\% \pm 2.0\% @ 632.8\text{nm}$

Dichroic Beamsplitter Mirrors (DBS)

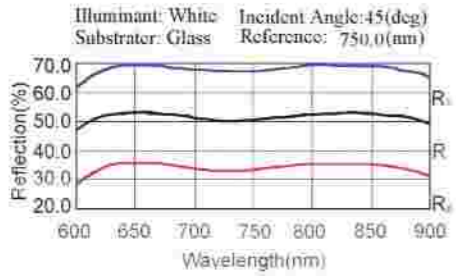


$R > 99.8\% @ 1064\text{nm}$ $R < 5\% @ 532\text{nm}$

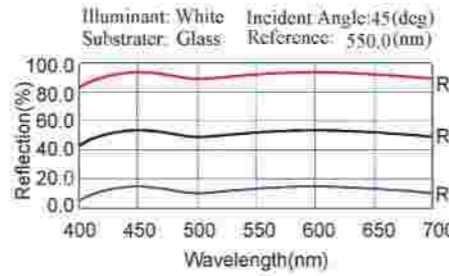


$R > 99.8\% @ 532\text{nm}$ $R < 5\% @ 1064\text{nm}$

Broadband Partial Reflective Coatings (BPR)

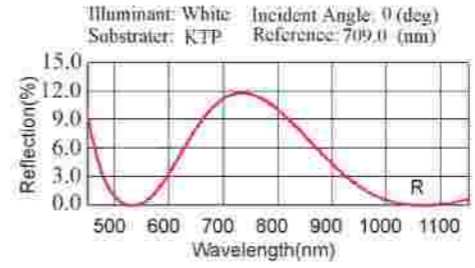


$R = 50\% \pm 5.0\% @ 650\text{--}900\text{nm}$

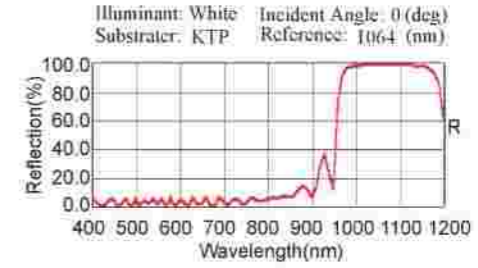


$R = 50.0\% \pm 5.0\% @ 450\text{--}700\text{nm}$

Diode Pumped Laser Optic Coatings (DPO)

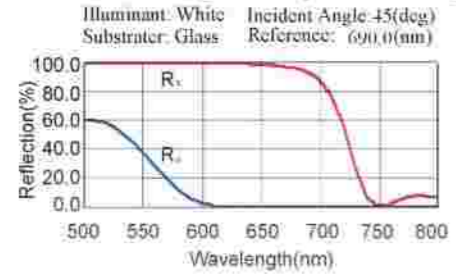


$R < 0.1\% @ 1064\text{nm}$ $R < 0.5\% @ 532\text{nm}$

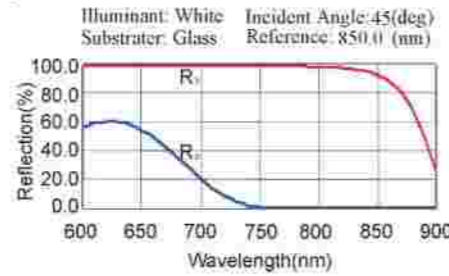


$R > 99.8\% @ 1064\text{nm}$ $R < 5.0\% @ 532\text{nm}$

Laser Line Polarizing Beamsplitter Coatings (LPS)

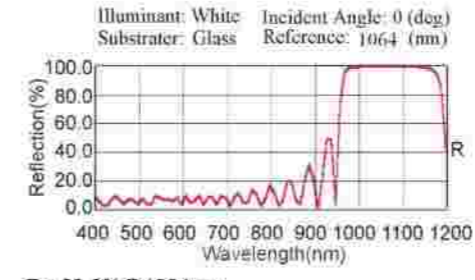


$R_s > 99.5\% @ 632.8\text{nm}$ $R_p < 5.0\% @ 632.8\text{nm}$

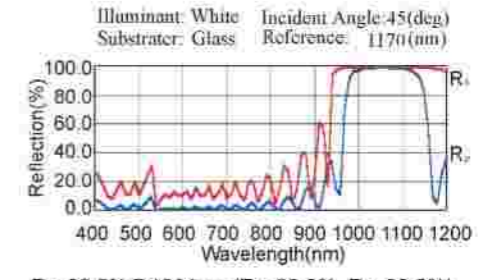


$R_s > 99.5\% @ 780\text{nm}$ $R_p < 5.0\% @ 780\text{nm}$

Dielectric High Reflective Coatings (DHR)

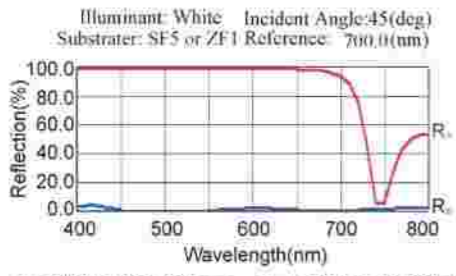


$R_0 > 99.8\% @ 1064\text{nm}$

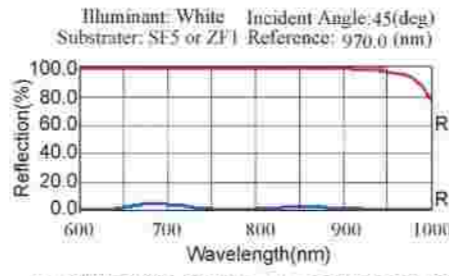


$R_0 > 99.5\% @ 1064\text{nm}$ ($R_s > 99.9\%$, $R_p > 99.2\%$)

Broadband Polarizing Beamsplitter Coatings (BPS)

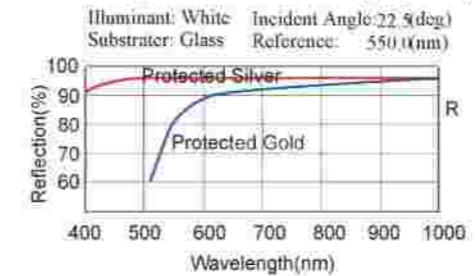


$R_s > 99\% @ 450\text{--}650\text{nm}$ $R_p < 5.0\% @ 450\text{--}650\text{nm}$

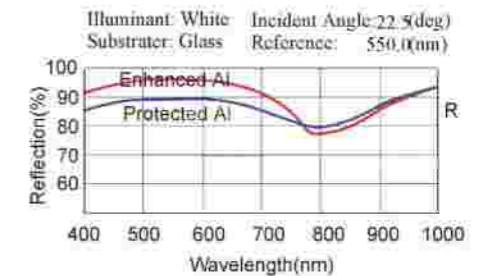


$R_s > 99\% @ 600\text{--}900\text{nm}$ $R_p < 5.0\% @ 600\text{--}900\text{nm}$

Metallic High Reflective Coatings (MHR)



$R_{avg} > 95\% @ 450\text{--}12000\text{nm}$ (Protected -Silver)
 $R_{avg} > 98\% @ 2000\text{--}12000\text{nm}$ (Protected -Gold)



$R_{avg} > 87\% @ 400\text{--}1200\text{nm}$ (Protected -Al)
 $R_{avg} > 93\% @ 400\text{--}1200\text{nm}$ (Enhanced -Al)

Quality, Environmental, Occupational Health and Safety Policy

- Honest Business, Excellent Quality and Persistent Innovation for Customer Satisfaction.
- Non-Pollution Operation, Energy and Resource Conservation for Environment Protection.
- People Oriented and Comprehensive Management for Safe and Healthy Work Environment.
- Law Compliance and Continuous Improvement for Top Performance and Steady Development.

Contact us

CASIX Inc.

P.O.Box 1103
20 Fuxing Street, Fuxing Investment District
Fuzhou, Fujian 350014, China
Phone: +86 591 8362-0115 (International Sales)
+ 86 591 8362-7334 (China Sales)
Fax: +86 591 8362-1248
E-mail: Sales@casix.com
Marketing@casix.com

CASIX USA Sales

1226 Quail Creek Cir
San Jose, CA 95120
USA
Tel: (408) 316-6373
Fax: (408) 414-7951
Email: Ranjit.mand@casix.ca

CASIX USA Sales Representative, VitroCom

P.O.Box 125
Mountain Lakes
New Jersey 07046-0125, USA
Phone: +1 973-402-1443
Fax: +1-973-402-1445
Email: Sales@vitrocom.com

CASIX Europe Sales

Obststr. 8
49393 Lohne
Germany
Tel: +49 (0) 4442 806 8660
Fax: +49 (0) 4442 806 8661
Email: jens.meyer@casix.eu

Vossenberglaan 19
6891 CJ Rozendaal
The Netherlands (NL)
Tel: +31 (0) 264 822 249
Mobile Phone: +31 (0) 652 004 736
Fax: +31 (0) 264 822 249
Email: sylvain.misat@casix.eu

