POLARIZATION COMPONENTS

We offer a wide range of cube and plate polarizers to perform under different operating conditions including high energy, broad bandwidths, low dispersion and high extinction. Our polarization components are designed to meet the most demanding needs and are available in a variety of coatings and materials to suit your operating wavelength(s). Custom dimensions and coatings are available for OEM applications.

We encourage you to contact our knowledgeable sales staff for more information.

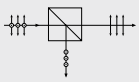
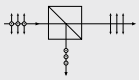
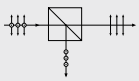
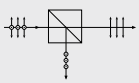
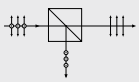
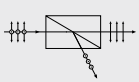
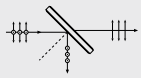
Don't see exactly what you are looking for?

CVI Laser Optics specializes in prototype to volume production manufacturing!

Give us a call and we will be honored to assist you with your custom needs.

NOTES:

SELECTION GUIDE

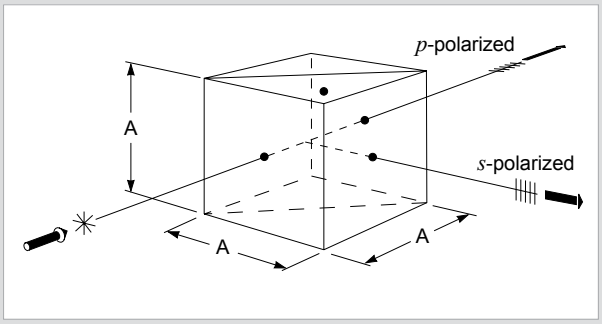
DIAGRAM	PRODUCT TYPE	OPERATION CONDITIONS	EXTINCTION RATIO TP/TS	POLARIZATION BANDWIDTH	TRANSMISSION EFFICIENCY	PAGE
Polarizing Cube Beamsplitters						
	UV LASER-LINE: UPBS	10 mJ/cm², 20ns, 20Hz; 10 W/cm² cw at 266nm	100:1	5nm at 257nm	90%	122
	LASER-LINE: PBS	1 J/cm², 20ns, 20Hz at 1064nm; 100 W/cm² cw at 515nm	1000:1	25nm at 515nm	95%	123
	HIGH-ENERGY LASER-LINE: PBSO	25 J/cm², 20ns, 20Hz; 1 MW/cm² cw at 1064nm	500:1 at 1064nm	5–10nm at 1064nm	95%	124
	ION BEAM SPUTTERED: PBSI	10 J/cm², 20ns, 20Hz; 1 MW/cm² cw at 1064nm	1,000:1 at 1064nm	5–10nm at 1064nm	97%	126
	BROADBAND: PBSH	500 mJ/cm², 20ns, 20Hz; 100 W/cm² cw at 515nm	500:1	>250nm at 532nm	90%	127
	HIGH-ENERGY BROADBAND: PBSK	5 J/cm², 20ns, 20Hz; 1 MW/cm² cw at 1064nm	1,000:1 at 1064nm	140nm at 532nm	92% at 800nm	128
Thin-Film Plate Polarizers						
	THIN-FILM PLATE POLARIZERS 56°: TFP	20 J/cm², 20ns, 20Hz; 1 MW/cm² cw at 1064nm	200:1 at 1064nm	5nm at 1064nm	95% at 1064nm	129
	ION BEAM SPUTTERED 45°: TFPN	10 J/cm², 20ns, 20Hz; 1 MW/cm² cw at 1064nm	500:1 at 1064nm	6–8nm at 1064nm	97% at 1064nm	130

APPLICATION NOTE

Polarizing cube beamsplitters separate polarization components of an incident beam into two highly polarized output beams separated by a 90° angle. The beam that passes straight through the cube is linearly *p*-polarized with the electric field vector parallel to the plane of incidence. The beam that emerges from the cube at right angles to the incident beam is linearly *s*-polarized with the electric field vector orthogonal to the plane of incidence.

When using a polarizing cube beamsplitter, remember:

- For polychromatic beam-combining applications, the two incoming beams must have properly oriented polarization states. This can be achieved by using a CVI Laser Optics half-wave plate (refer to QWPM or QWPO) to rotate the polarization state of the beam.
- Only collimated beams of light can be used.
- Light should be incident on the beamsplitter coating (hypotenuse surface) at an angle of 45° ± 2°.



Polarizing cube beamsplitters

UV LASER LINE POLARIZING CUBE BEAMSPLITTERS: UPBS

Specifications

Product Code: UPBS

Optical Material:
Standard Grade Corning 7980 1-D (Fused Silica)

Edge Dimension Tolerance (A): ±0.25mm

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): < λ/4 p-v at 633nm

Clear Aperture: ≥ 85% of central dimension

Field of View: ±2° typical

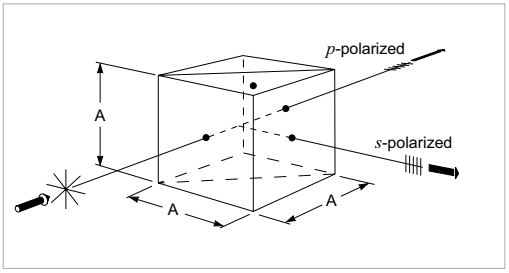
Anti-reflection Coating: R ≤ 0.25%, all entrance and exit surfaces

Extinction Ratio: T_p/T_s > 100:1

Transmission Efficiency: T_p > 90.0%

Reflection Efficiency: R_s > 99.0%

Damage Threshold:
Pulsed: 10 mJ/cm², 20ns, 20Hz at 266nm
cw: 10 W/cm² at 266nm



UPBS UV laser line polarizing beamsplitter cubes

These polarizing cube beamsplitters are made from fused silica to optimize UV performance.

To avoid damage when using a laser, be sure to orient the cube so that the beam enters through the prism marked with the dot.

- Fused-silica cube polarizers for doubled argon, tripled Nd:YAG, quadrupled Nd:YAG, and UV excimer lasers
- For use with fluences less than 10 mJ/cm²
- Index matching optical adhesive assembly (low absorbing, high UV transmission)
- Contact CVI Laser Optics for alternate wavelengths, dimensions, or other specification changes for OEM applications

UV LASER LINE POLARIZING CUBE BEAMSPLITTERS	
12.7mm Cube	
Wavelength (nm)	PART NUMBER
355	UPBS-355-050
405	UPBS-405-050
25.4mm Cube	
Wavelength (nm)	PART NUMBER
355	UPBS-355-100
405	UPBS-405-100

Please see page T-38 for coating traces.

Polarizing beamsplitter cubes are used to split a laser beam into two orthogonally polarized components; *p*-polarization is transmitted straight through while *s*-polarization is reflected at 90°.

To avoid damage when using a high power laser, be sure to orient the cube so that the beam enters through the prism face marked with the dot.

- Projection systems, signal monitoring, color separation and recombination, optical coupling
- Fewer ghost images than plate beamsplitters
- Index matching optical adhesive assembly (low absorbing, high VIS/NIR transmission)
- 1000:1 extinction ratio

Specifications

Product Code: PBS

Optical Material: N-BK7

Edge Dimension Tolerance (A): ±0.25mm

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE):
< λ/4 p-v at 633nm

Clear Aperture: ≥ 85% of central dimension

Field of View: ±3°

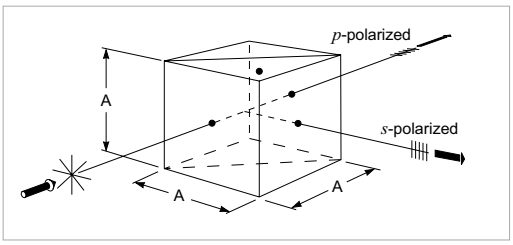
Anti-reflection Coating: R ≤ 0.25% per surface

Extinction Ratio: T_p/T_s > 1000:1

Transmission Efficiency: T_p > 95%

Reflection Efficiency: R_s > 99.9%

Damage Threshold:
Pulsed: 1 J/cm², 20ns, 20Hz at 1064nm
cw: 100 W/cm² at 515nm



PBS laser line polarizing beamsplitter cubes

LASER LINE POLARIZING CUBE BEAMSPLITTERS	
12.7mm Cube	
Wavelength (nm)	PART NUMBER
532	PBS-532-050
780	PBS-780-050
800	PBS-800-050
810	PBS-810-050
830	PBS-830-050
850	PBS-850-050
1030	PBS-1030-050
1064	PBS-1064-050
1550	PBS-1550-050
25.4mm Cube	
Wavelength (nm)	PART NUMBER
532	PBS-532-100
780	PBS-780-100
800	PBS-800-100
1064	PBS-1064-100

Please see page T-38 for coating traces.

HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBSO

Specifications

Product Code: PBSO

Optical Material:
Standard Grade Corning 7980 1-D (Fused Silica)

Edge Dimension Tolerance: A±0.25mm

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Beam Deviation: < 5 arc minutes

Transmitted Wavefront Error (TWE): < λ/4 p-v at 633nm

Clear Aperture: ≥ 85% of central dimension

Anti-reflection Coating:
R ≤ 0.25%, all entrance and exit surfaces

Extinction Ratio:
λ > 500nm: T_p/T_s > 500:1; > 750:1 typical
λ ≤ 500nm: T_p/T_s > 250:1; > 500:1 typical

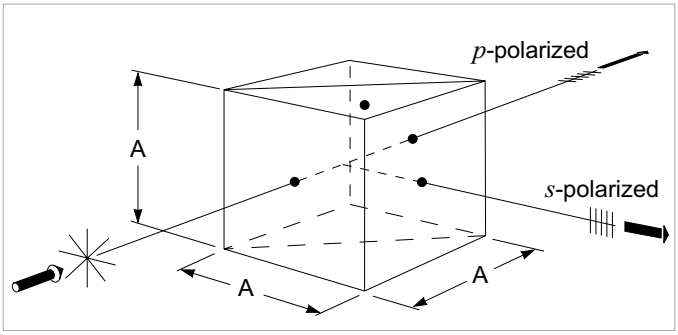
Transmission Efficiency:
T_p > 95%

Reflection Efficiency:
λ > 500nm R_s > 99.5%
λ ≤ 500nm R_s > 99.0%

Damage Threshold:
Pulsed:
25 J/cm², 20ns, 20Hz at 1064nm
15 J/cm², 20ns, 20Hz at 532nm
3 J/cm², 20ns, 20Hz at 355nm
2 J/cm², 20ns, 20Hz at 266nm
cw: 1 MW/cm² at 1064nm

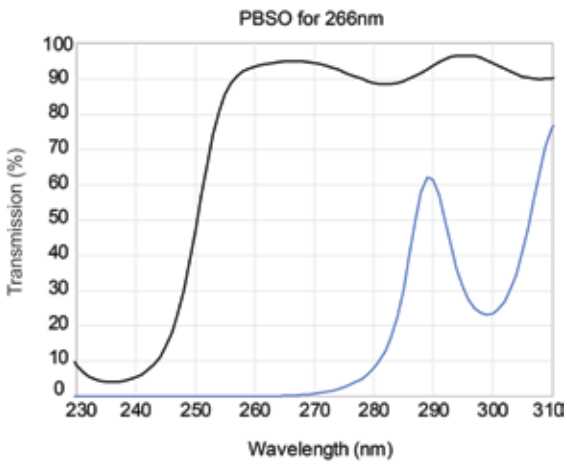
CVI Laser Optics' high-energy, polarizing cube coatings are designed for optimal extinction ratio (Tp/Ts) and laser damage threshold. Via optical contacting, the cube remains free of adhesive within the clear aperture, preventing any environmental and spectral anomalies that can be attributed by said adhesive. For applications requiring higher transmission efficiency (i.e. T_p > 98.0%), a reduction in extinction ratio can be applied.

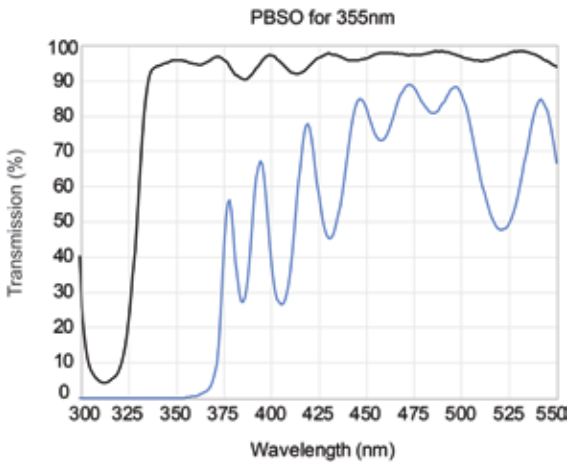
- Adhesive free; optically contacted
- High laser damage threshold
- 750:1 extinction ratio typical

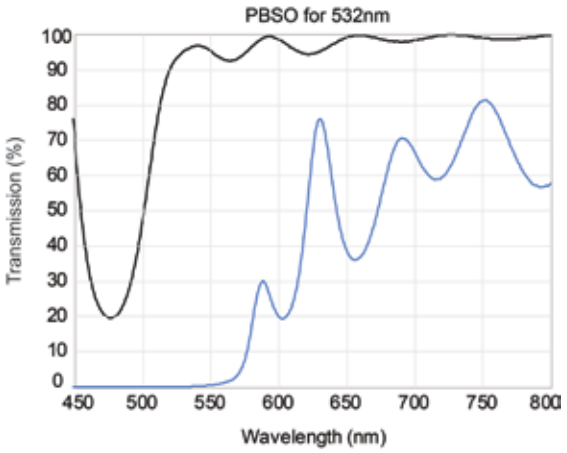


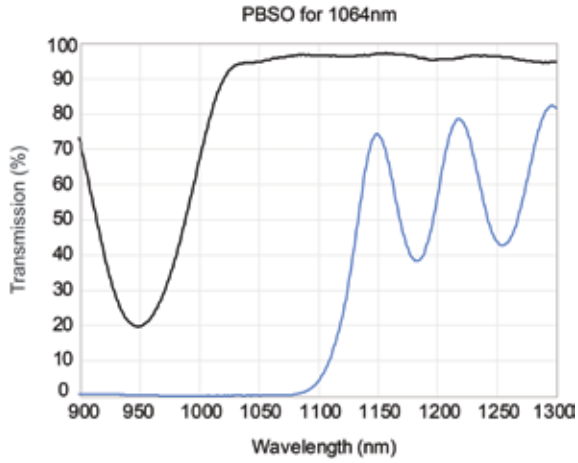
PBSO high energy laser line polarizing beamsplitter cubes

HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS		
Wavelength (nm)	PART NUMBER	
	12.7mm Cube	25.4mm Cube
266	PBSO-266-050	PBSO-266-100
355	PBSO-355-050	PBSO-355-100
532	PBSO-532-050	PBSO-532-100
1064	PBSO-1064-050	PBSO-1064-100







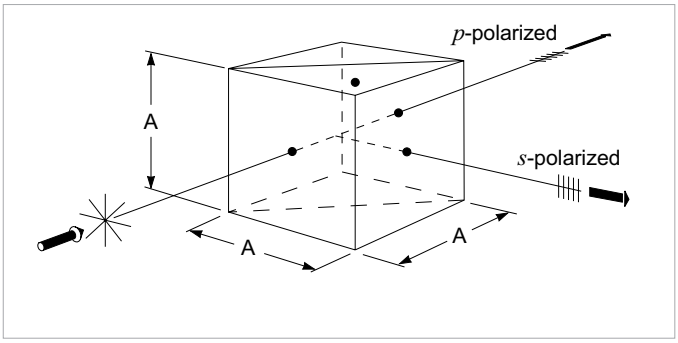


P-POL: ——— UNP: - - - - - S-POL: ——— 0°: - - - - - -

ION BEAM SPUTTERED HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBSI

Call us for more information on custom polarizers and beamsplitter cube designs

- High energy laser line polarizer cube
- Reflected and transmitted beams separated by 90°



PBSI ion beam sputtered high energy laser line polarizing beamsplitter cubes

Specifications

Product Code: PBSI

Optical Material:
Standard Grade Corning 7980 0-A (Fused Silica)

Edge Dimension Tolerance (A): ±0.25mm

Transmitted Beam Deviation: < 3 arc minutes

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): < λ/4 p-v at 633nm

Reflected Wavefront Error (RWE): < λ/4 p-v at 633nm

Clear Aperture: ≥ 85% of central dimension

Anti--reflection Coating: R ≤ 0.20%, all entrance and exit surfaces

ION BEAM SPUTTERED HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS

Wavelength (nm)	$T_{p\text{-}pol}$	Extinction Ratio T_p/T_s	Damage Threshold	PART NUMBER
355	> 95.0%	> 500:1	2 J/cm² @ 355nm	PBSI-355-050
532	> 96.0%	> 750:1	4 J/cm² @ 532nm	PBSI-532-050
1064	> 97.0%	> 1000:1	10 J/cm² @ 1064nm	PBSI-1064-050

Visit cvilaseroptics.com for traces..

These broadband polarizing beamsplitter cubes are made from N-SF2 glass to improve broadband performance. A multi-layer anti-reflective coating is applied to each face of the beamsplitter to ensure maximum transmission efficiency.

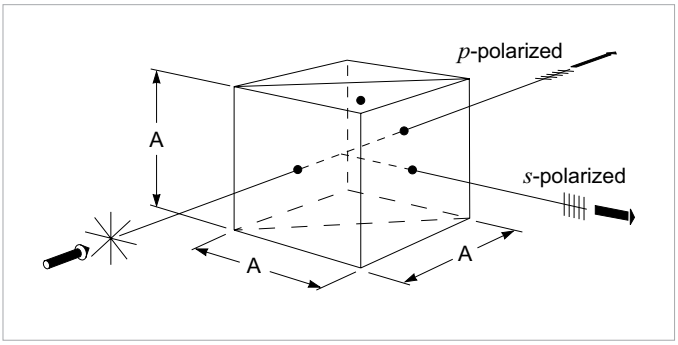
To avoid damage when using a laser, be sure to orient the cube so that the beam enters through the prism marked with the dot.

- Broadband performance
- Reflected and transmitted beams separated by 90°
- Optical adhesive assembly
- Contact CVI Laser Optics for OEM opportunites for other wavelengths or dimensions

Specifications

Product Code: PBSH

Optical Material: Schott N-SF2 glass
Edge Dimension Tolerance (A): ±0.25mm
Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b
Transmitted Wavefront Error (TWE): < λ/4 p-v at 633nm
Clear Aperture: ≥ 85% of central dimension
Field of View: ±2.5°
Anti-reflection Coating: See table
Extinction Ratio: T_p/T_s>500:1
Transmission Efficiency (Tp avg): > 90%
Reflection Efficiency: R_s > 99.5% average
Clear Aperture: ≥ 85% of central dimension
Damage Threshold:
Pulsed: 500 mJ/cm², 20ns, 20Hz at 515nm
cw: 100 W/cm² at 515nm



PBSH broadband polarizing cube beamsplitters

VISIBLE AND NEAR-IR BROADBAND POLARIZING CUBE BEAMSPLITTER		
12.7mm Cube		
Wavelength Range (nm)	R_{avg} (per surface)	PART NUMBER
450 – 700	<0.5%	PBSH-450-700-050
450 – 1300	<2.5%	PBSH-450-1300-050
450 – 2000	<3.0%	PBSH-450-2000-050
670 – 980	<0.5%	PBSH-670-980-050
25.4mm Cube		
Wavelength Range (nm)	R_{avg} (per surface)	PART NUMBER
450 – 700	<0.5%	PBSH-450-700-100
450 – 1300	<2.5%	PBSH-450-1300-100
450 – 2000	<3.0%	PBSH-450-2000-100

Please see page T-38 for coating traces.

HIGH ENERGY BROADBAND POLARIZING CUBE BEAMSPLITTERS: PBSK

An alternative to calcite and Brewster angle polarizers, the PBSK is an optimal solution for high-energy broadband or multi-line systems. Unlike cemented cube polarizers, the PBSK is optically contacted, coated with all-dielectric materials and manufactured from fused silica to ensure high transmission and high damage threshold.

To avoid damage when using a high power laser, be sure to orient the cube so that the beam enters through the prism marked with the dot.

- Designed for Pulse Lengths > 15 fs
- Contact CVI Laser Optics for other designs between 230nm and 2100nm

Specifications

Product Code: PBSK

Optical Material:
Standard Grade Corning 7980 1-D (Fused Silica)

Edge Dimension Tolerance (X,Y): ±0.25mm

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

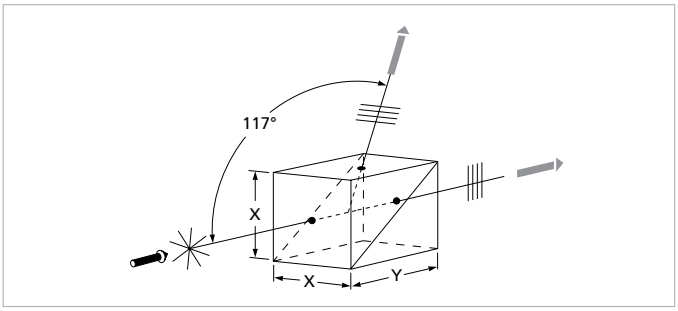
Transmitted Wavefront Error (TWE): < λ/4 p-v at 633nm

Clear Aperture: ≥ 85% of central dimension

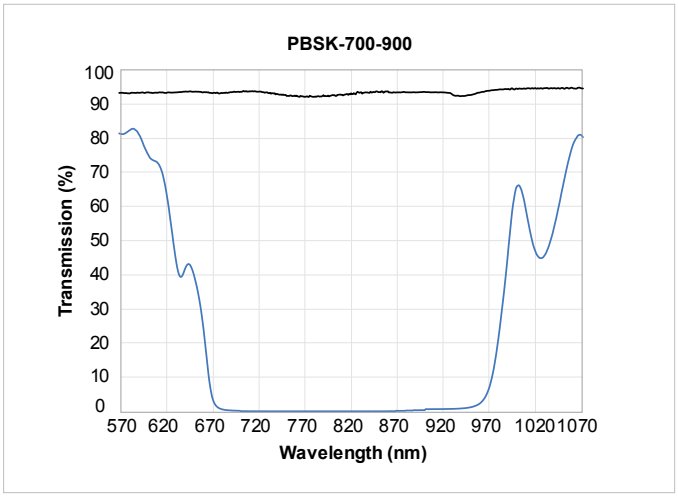
Extinction Ratio: T_p/T_s > 1000:1

Anti-reflection Coating:
R_{avg} ≤ 0.50%, all entrance and exit surfaces

Damage Threshold:
Pulsed: 5 J/cm², 20ns, 20Hz at 1064nm
cw: 1 MW/cm² at 1064nm



PBSK high-energy broadband polarizing beamsplitter cubes



P-POL: —— UNP: - - - - - S-POL: —— 0°: - - - - - -

HIGH ENERGY BROADBAND POLARIZING CUBE BEAMSPLITTERS	
X x Y (mm)	PART NUMBER
12.7x17.5	PBSK-700-900-050
15.4x35.3	PBSK-700-900-100

THIN-FILM PLATE POLARIZERS, 56°: TFP

TFP thin-film plate polarizers are the best choice when maximum laser damage resistance is necessary. Typically, thin film polarizers are used for fluences greater than 500 mJ/cm^2, where calcite air-spaced polarizers exhibit long-term tracking and cemented polarizers cannot be used at all. Applications for the TFP include usage as an intracavity Q-switch hold-off polarizer, and, in conjunction with a half-wave plate, as an extracavity attenuator for an Nd:YAG laser fundamental and its harmonics. To maximize transmission, users must make a provision in their mechanical setup for the necessary angular tuning. Note that the losses at the uncoated second surface are insignificant at 83° from Brewster's angle.

- High damage threshold Brewster-angle polarizer, >20 J/cm^2
- Angle tuning suggested to achieve maximum transmission
- Contact CVI Laser Optics for alternate wavelengths, dimensions and OEM capabilities

Specifications

Product Code: TFP

Optical Material:
Standard Grade Corning 7980 1-D (Fused Silica)

Diameter Tolerance: +0/-0.25mm

Thickness Tolerance: ±0.25mm

Wedge: ≤ 5 arc minutes

Chamfer: 0.35mm leg width at 45° nominal

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Surface Figure: < λ/10 at 633nm before coating on select substrates

Transmitted Wavefront Error (TWE): < λ/8 p-v at 633nm

Transmission Efficiency: λ ≥ 527nm: 95%, λ = 355nm: 90%, λ = 248nm or 266nm: 85%

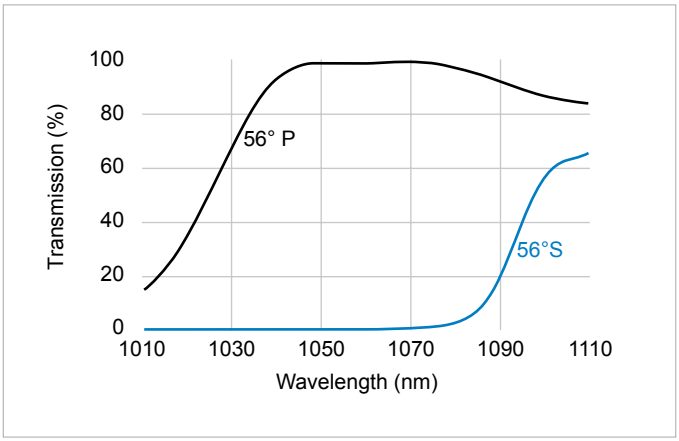
Tp/Ts,:

λ ≥ 527nm: 200:1 λ = 248nm, 266nm and 355nm: 100:1

Clear Aperture: ≥ 85% of central diameter

Damage Threshold:
Pulsed: 20 J/cm^2, 20ns, 20Hz at 1064nm
cw: 1 MW/cm^2 at 1064nm

Angle of Incidence: 56°±3°



Transmission vs wavelength of TFP series 1064-nm thin film polarizer

THIN-FILM PLATE POLARIZERS 56°			
Center Wavelength (nm)	Dimensions (mm)	t (mm)	PART NUMBER
355	∅ 25.4	6.35	TFP-355-PW-1025-UV
355	∅ 50.8	6.35	TFP-355-PW-2025-UV
355	28.6x14.3	3.18	TFP-355-RW-28.6-14.3-3.2-UV
527	28.6x14.3	3.18	TFP-527-RW-28.6-14.3-3.2-UV
532	∅ 25.4	6.35	TFP-532-PW-1025-UV
532	∅ 50.8	6.35	TFP-532-PW-2025-UV
532	28.6x14.3	3.18	TFP-532-RW-28.6-14.3-3.2-UV
1053	28.6x14.3	3.18	TFP-1053-RW-28.6-14.3-3.2-UV
1064	∅ 25.4	6.35	TFP-1064-PW-1025-UV
1064	∅ 50.8	6.35	TFP-1064-PW-2025-UV
1064	28.6x14.3	3.18	TFP-1064-RW-28.6-14.3-3.2-UV

Please see page T-38 for coating traces.

ION BEAM SPUTTERED THIN-FILM PLATE POLARIZERS, 45°: TFPN

TFPN thin-film plate polarizers are an ideal choice when both high laser damage threshold and a 90° reflection angle are necessary. Unlike Brewster angle polarizers which work at an angle of incidence of 56°, the TFPN plate polarizer works at 45°. Consequently, the reflected and transmitted beams are separated by 90° and orthogonally polarized, just like a cube polarizer.

- High-energy laser line polarizer
- Reflected and transmitted beams separated by 90°
- No angle tuning required
- RoHS compliant
- Contact CVI Laser Optics for other wavelengths and sizes

Specifications

Product Code: TFPN

Optical Material:
Standard Grade Corning 7980 1-D (Fused Silica)

Diameter: 25.4mm +0/-0.25mm

Thickness: 6.35mm ±0.25mm

Wedge: ≤ 5 arc minutes

Chamfer: 0.35mm leg width at 45° nominal

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): < λ/8 p-v at 633nm

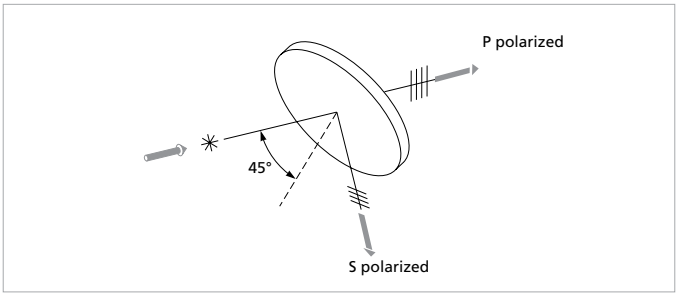
Clear Aperture: ≥ 85% of central diameter

Transmission Efficiency: λ=1064nm: T_p >97%, λ=532nm: T_p >96%

T_p/T_s: >500:1

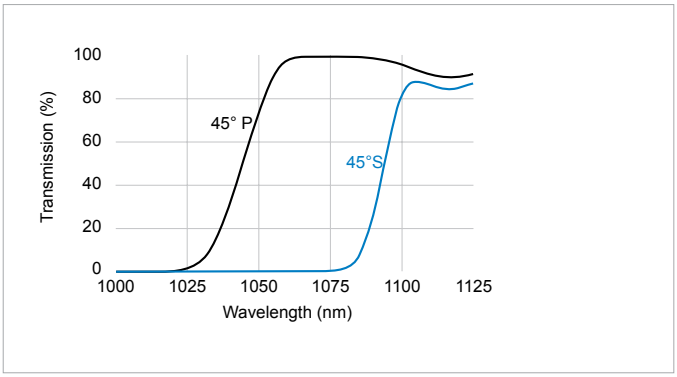
Damage Threshold:
Pulsed: 10 J/cm², 20ns, 20Hz at 1064nm
cw: 1 MW/cm² at 1064nm

Angle of Incidence: 45°



TFPN 45° thin film plate polarizers

ION BEAM SPUTTERED THIN-FILM PLATE POLARIZERS, 45°	
Wavelength (nm)	PART NUMBER
532	TFPN-532-PW-1025-UV
1064	TFPN-1064-PW-1025-UV



Transmission versus wavelength of TFPN series 1064nm thin film plate polarizers