Linear Polarizer Selection

Polarizers allow the transmission of only one polarization state. A linear (or plane) polarizer transmits light polarized in a single plane. The output polarization axis orientation is independent of the input beam polarization state. The plane of polarization is changed by rotating the linear polarizer about its beam axis.

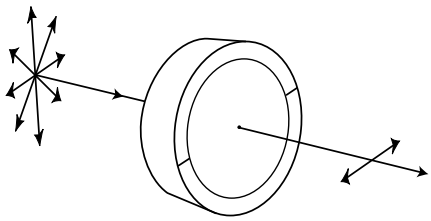


Fig. 2-1 Regardless of input polarization, a linear polarizer transmits only linearly polarized light.

A "perfect" linear polarizer transmits 50% of an unpolarized input beam. Two perfect polarizers with their transmission axes crossed will totally extinguish an incident beam.

When choosing a linear polarizer, several key factors must be considered, including: cost, wavelength range, aperture size, acceptance angle, damage resistance, transmission efficiency, and extinction ratio.

Extinction ratio is defined as the ratio of transmitted intensity through crossed polarizers to the transmitted intensity through parallel polarizers. Meadowlark Optics offers polarizers with extinction ratios as low as 10^{-5} over the operating wavelength range.

Meadowlark Optics offers four types of linear polarizers: dichroic, dielectric coating (beamsplitting polarizers), calcite crystal, and wire grid.

Dichroic Polarizers

Dichroic refers to the polarization selective absorption of the anisotropic polarizing material. Meadowlark Optics offers an extensive line of dichroic sheet polarizers. These polarizers are constructed by laminating a thin, stretched, and dyed polymer film between two polished and antireflection coated glass windows. The resulting compact component offers excellent value and is often the best choice for flux densities below 1 watt/cm^2.

Selecting the appropriate dichroic polarizing material enables excellent extinction ratio performance over the wavelength range from 310 to 2300 nm for small apertures. Due to small material variations in the polarization axis direction, extinction ratios degrade over larger apertures for all dichroic polarizers.

Meadowlark Optics has improved the transmission of dichroic sheet polarizers with high-efficiency, broadband antireflection coatings on the glass windows used in our product construction. Sturdy glass construction contributes to a substantial improvement in transmitted wavefront distortion. Our polarizer construction greatly improves the product durability, allowing for easy and repeated cleaning.

Meadowlark Optics also offers a line of high contrast dichroic glass polarizers for the near infrared region of the spectrum. High throughput and contrast makes these polarizers an excellent choice for near infrared requirements.

Key advantages of dichroic polarizers include superior angular acceptance and extreme flexibility for custom shapes and sizes. Please call our Sales Department for assistance.

Beamsplitting Polarizers

Beamsplitting polarizers divide unpolarized incident light into two orthogonal, linearly polarized beams. Low absorption coatings provide an excellent combination of damage resistance and extinction ratio at a moderate price. Rugged beamsplitter cubes are easily mounted and therefore designed into many instrument applications.

Beamsplitting polarizers offer the unique advantage of providing two linearly polarized output beams, one transmitting straight through, the second "splitting" off at precisely 90°.

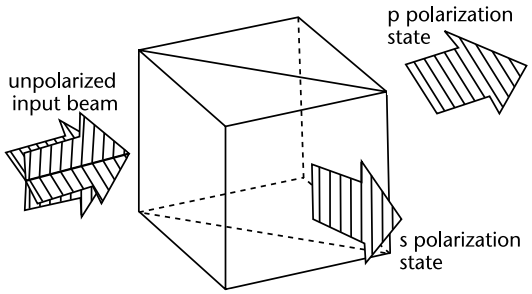


Fig. 2-2 Beamsplitting polarizers provide two orthogonally polarized beams, conveniently separated by 90°.

When necessary, the extinction ratio of the reflected beam can be dramatically improved by adding a dichroic polarizer to the output face.

Meadowlark Optics offers both Laser Line and Broadband Beamsplitting Polarizers, covering visible to near infrared applications.

Laser Line Beamsplitting Polarizers offer the advantage of V-type antireflection coating, improving efficiency by limiting surface losses. Broadband Beamsplitting Polarizers can be more versatile for tunable wavelength or broadband sources.

Calcite Polarizers

Calcite is a naturally-occurring birefringent crystal with excellent polarization properties including very high extinction ratio and transmission efficiency. Aperture sizes are limited, since large optically uniform pieces of this natural crystal are rare.

Calcite material exhibits extremely broadband transmission performance, from 320 to 2300 nm. Meadowlark Optics offers Glan-Thompson calcite polarizers. Manufactured from Grade A optical calcite material, the design takes advantage of total internal reflection to separate the two polarization components.

Glan-Thompson Polarizers are recommended where a larger acceptance angle is important for overall system performance. However, the cemented construction limits both power handling and ultraviolet performance.

Wire grid polarizers (VersaLight) can handle relatively high powers and are rugged when coated. They offer high contrast across large sections of the Visible and Near Infra-Red Spectrum.

Specially selected ultraviolet transmissive material is available on a custom basis. Please contact the Meadowlark Optics Sales Department for assistance.

Polarizer and Retarder References:

1. J.M. Bennett, "Polarization," in *Handbook of Optics*, edited by M. Bass, (McGraw-Hill, New York, 1995), Vol. I, Chap. 5; J.A. Dobrowolski, "Optical Properties of Films and Coatings," *ibid.*, Vol. I, Chap. 42; J.M. Bennett, "Polarizers," *ibid.*, Vol. II, Chap. 3; S. Wu, "Liquid Crystals," *ibid.*, Vol. II, Chap. 14.
2. D. Clarke and J.F. Grainger, *Polarized Light and Optical Measurement*, (Pergamon Press, New York, 1971).
3. D.S. Kliger, J.W. Lewis, and C.E. Randall, *Polarized Light in Optics and Spectroscopy*, (Academic Press, San Diego, Calif., 1990).
4. W.A. Shurcliff, *Polarized Light: Production and Use*, (Harvard University Press, Cambridge, Mass., 1966).
5. D.A. Holmes, "Exact Theory of Retardation Plates," J. Opt. Soc. Am. **54**, 1115 (1964).
6. P.D. Hale and G.W. Day, "Stability of Birefringent Linear Retarders (Waveplates)," Appl. Opt. **27** (24), 5146 (1988).
7. D. Malacara, *Optical Shop Testing*, (John Wiley and Sons, New York, 1978).
8. G. Love, "Wave-front Correction and Production of Zernike Modes with a Liquid-Crystal Spatial Light Modulator", Appl. Opt. **36** (7), 1517 (1997)

Polarizer Selection Chart

Polarizer Type	Page	Product Features	Wavelength Range (nm)
			500 1000 1500
Unpolarized → Linear Polarizers			
Precision Dichroic Polarizer	6	• ultraviolet, visible, near infrared wavelengths • low transmitted wavefront distortion • high extinction ratios • excellent surface quality	
High Contrast NIR Polarizers	8	• high contrast • high transmission • low wavefront distortion • high temperature resistance	
Commercial Dichroic Polarizers	9	• low transmitted wavefront distortion • economical cost • high volume applications	
VersaLight	10	• wire grid reflective polarizer • visible near infrared • ultraviolet version available • up to 100 mm clear aperature	
Polarization Separation Beamsplitters			
Laser Line Beamsplitting Polarizers	12	• high contrast • low reflectance • high damage threshold • low transmitted wavefront distortion	
Broadband Beamsplitting Polarizers	14	• broad spectral range • high contrast • low reflectance • high damage threshold	
Calcite Polarizers			
Glan-Thompson Polarizers	16	• excellent extinction ratio • broad spectral range	
Unpolarized → Circular Polarizers			
Dichroic Circular Polarizers	18	• high isolation • low transmitted wavefront distortion • large diameters available	
Beam Separators	19	• high isolation • low transmitted wavefront distortion	

standard *custom options*

Polarizer Selection Chart

Reflectance (per surface)	Beam Deviation	Transmitted Wavefront Distortion (PV at 632.8nm)	Angular Acceptance	Clear Aperture in.	Relative Cost Comparison
0.50%	UV, IR } 2 arc min VIS - 1 arc min	UV: λ/2 VIS: λ/5 NIR: λ/2	—	0.40, 0.70 1.20	$$
					$$$$
0.50%	3 arc min	3λ/in.	—	0.40, 0.70, 1.20	$
see data page		λ/2 per inch		specify	$
0.25%	Trans: ±3 arc min Ref: ±6 arc min	Transmitted: λ/5 Reflected: λ/2	±2°	0.40 0.80	$$
1.00%	Trans: ±3 arc min Ref: ±6 arc min	Transmitted: λ/5 Reflected: λ/2	±2°	0.40 0.80	$$
0.50%	±3 arc min		±5°	10 mm	$$$
0.5%				0.40, 0.70 1.20	$$$
0.25%	±3 arc min	Transmitted: λ/5 Reflected: λ/2	±2°	0.40 0.80	$$$

Precision Linear Polarizers

Meadowlark Optics manufactures Precision Linear Polarizers using dichroic sheet polarizer material laminated between high quality glass substrates (BK-7 material, λ/10 flat). For visible wavelength polarizers, this construction produces a total transmitted wavefront distortion of less than λ/5.

We use various polarizer materials to cover wavelengths between 320 and 2000 nm. Both visible and near infrared polarizers are supplied with a high-efficiency, broadband antireflection (AR) coating; single-layer AR coatings are optional on our ultraviolet polarizers.

Our line of High Contrast Near Infrared Polarizers (page 8) covers the spectral range from 630 to 1580 nm. We also offer custom polarizers to cover specific wavelength ranges.

Both mounted and unmounted Precision Linear Polarizers are offered as standard products. All Meadowlark Optics polarizers have their transmission axis clearly marked.

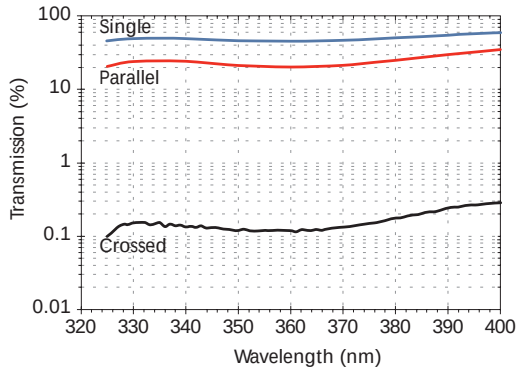


*Fig. 2-3 UV1: Ultraviolet Polarizer**

* All measurements made with 1mm beam diameter. [Contrast = parallel/crossed]

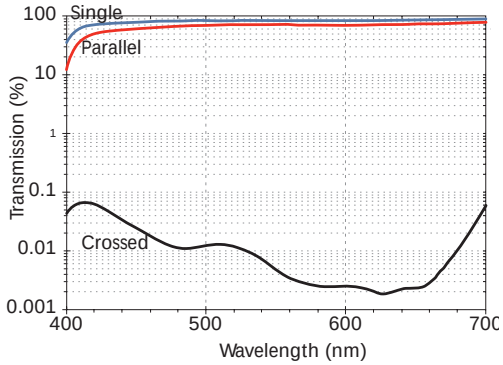


*Fig. 2-4 VIS1: Visible Polarizer**

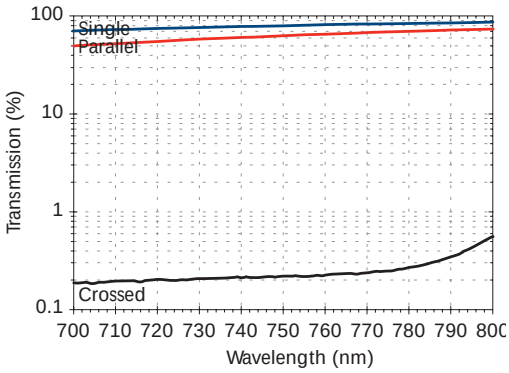


Fig. 2-5 NIR1: Near Infrared Polarizer 1
Usable range 700-800 nm.

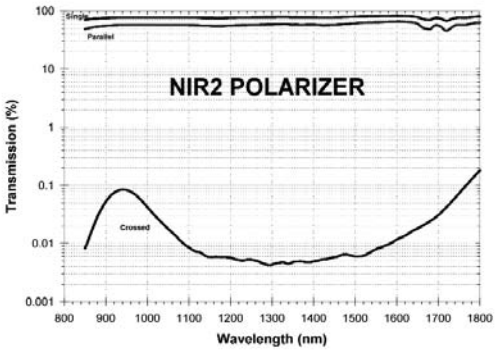


*Fig. 2-6 NIR2: Near Infrared Polarizer 2**

Custom sizes of our Precision Polarizers are available. Please call for a quote.

Please contact our sales department to obtain a price list of our standard components.

Precision Linear Polarizers

Key Benefits

- Ultraviolet, visible, near infrared wavelengths
- Low transmitted wavefront distortion
- High extinction ratios
- Excellent surface quality
- Wide angular acceptance

Specifications

Polarizer Material:	Dichroic Polymer
Substrate Material:	
Ultraviolet:	UV Grade Synthetic Fused Silica
Visible:	BK-7 Grade A, fine annealed
Near Infrared:	BK-7 Grade A, fine annealed
Transmitted Wavefront Distortion (peak to valley at 632.8 nm):	
Ultraviolet:	≤ λ/2
Visible:	≤ λ/5
Near Infrared:	≤ λ/2
Surface Quality:	≤ 40-20 scratch and dig
Beam Deviation:	
Ultraviolet:	≤ 2 arc min
Visible:	≤ 1 arc min
Near Infrared:	≤ 2 arc min
Reflectance (per surface):	
Ultraviolet:	4.25% (uncoated) at normal incidence
Visible:	≤ 0.5% at normal incidence
Near Infrared:	≤ 0.5% at normal incidence
Diameter Tolerance:	
Mounted:	±0.005 in.
Unmounted:	+0/-0.010 in.
Storage Temperature Range:	
Ultraviolet:	-50 8C to +50 8C
Visible:	-50 8C to +50 8C
Near Infrared:	-50 8C to +40 8C
Recommended Safe Operating Limit:	1W/cm^2 CW 200 mJ/cm^2 20ns, visible 2 J/cm^2, 20ns, 1064nm

Prolonged exposure to strong ultraviolet radiation may damage these polarizers.

Ordering Information

Diameter D (in.)	Clear Aperture(in.)	Thickness	Part Number
Mounted			
1.00	0.40	.23	DPM-050-UV1
1.00	0.40	.23	DPM-050-VIS1
1.00	0.40	.23	DPM-050-NIR1
1.00	0.40	.23	DPM-050-NIR2-1
1.00	0.40	.23	DPM-050-NIR2-2
1.00	0.40	.23	DPM-050-NIR2-3
1.00	0.70	.35	DPM-100-UV1
1.00	0.70	.35	DPM-100-VIS1
1.00	0.70	.35	DPM-100-NIR1
1.00	0.70	.35	DPM-100-NIR2-1
1.00	0.70	.35	DPM-100-NIR2-2
1.00	0.70	.35	DPM-100-NIR2-3
2.00	1.20	0.50	DPM-200-UV1
2.00	1.20	0.50	DPM-200-VIS1
2.00	1.20	0.50	DPM-200-NIR1
2.00	1.20	0.50	DPM-200-NIR2-1
2.00	1.20	0.50	DPM-200-NIR2-2
2.00	1.20	0.50	DPM-200-NIR2-3
Unmounted			
0.50	0.40	0.13	DP-050-UV1
0.50	0.40	0.13	DP-050-VIS1
0.50	0.40	0.13	DP-050-NIR1
0.50	0.40	0.13	DP-050-NIR2-1
0.50	0.40	0.13	DP-050-NIR2-2
0.50	0.40	0.13	DP-050-NIR2-3
1.00	0.80	0.25	DP-100-UV1
1.00	0.80	0.25	DP-100-VIS1
1.00	0.80	0.25	DP-100-NIR1
1.00	0.80	0.25	DP-100-NIR2-1
1.00	0.80	0.25	DP-050-NIR2-2
1.00	0.80	0.25	DP-050-NIR2-3

AR coating is available on UV polarizers.

High Contrast Near Infrared Polarizers

In response to the need for improved contrast in the near infrared region, Meadowlark Optics offers a new line of high contrast near infrared polarizers. These polarizers are constructed by laminating Polarcor™ dichroic glass polarizers between high quality glass substrates to achieve superior wavefront performance and surface quality.

Meadowlark Optics' High Contrast Near Infrared Polarizers offer the performance of calcite polarizers in large apertures. Extinction ratios are available as high as 10,000:1. Wavelength ranges from 630 to 1580 nm with 60 to 80 nm bandpasses and sizes from 10 mm to 25 mm are available. Please contact one of Meadowlark Optics Sales Engineers to discuss your specific application.

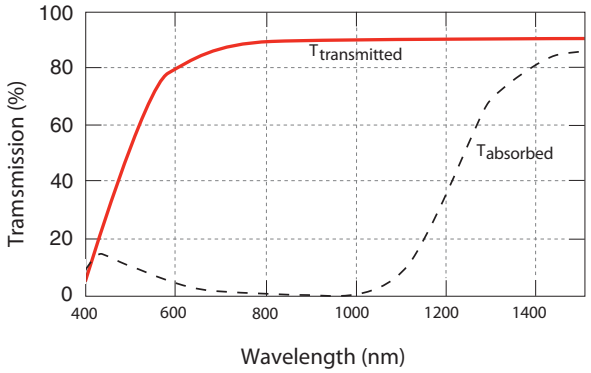


Fig. 2-7 Typical transmission for a sample polarizer

Key Benefits

- High transmission
- High extinction (10,000:1 available)

Specifications

Polarizer Material:	Dichroic Glass
Substrate Material:	BK7
Transmitted Wavefront Distortion (at 632.8 nm):	≤ λ/4
Surface Quality:	≤ 40-20 scratch and dig
Beam Deviation:	≤ 3 arc min
Reflectance (per surface):	0.5% at normal incidence
Temperature Range:	-50 °C to +70 °C
Recommended Safe Operating Limit:	1W/cm² CW 200 mJ/cm² 20ns, visible 2 J/cm², 20ns, 1064nm

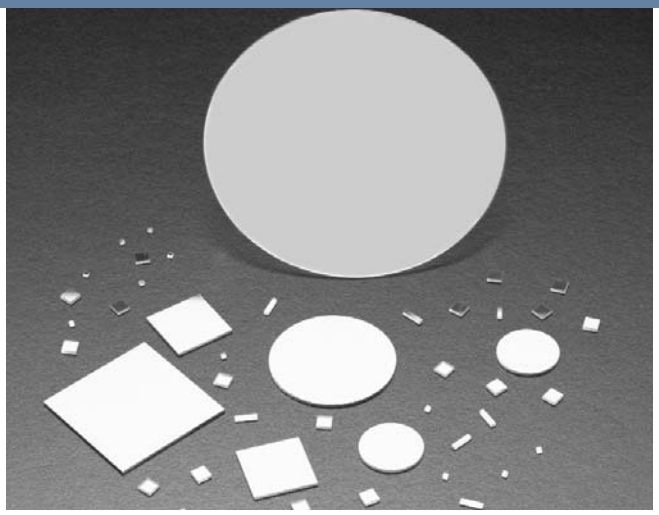
Prolonged exposure to strong ultraviolet radiation may damage these polarizers.

Ordering Information

Diameter D	Clear Aperture	Wavelength Range	Part Number
1.0 in.	0.4 in.	specify	PPM - 050 - λ
1.0 in.	0.8 in.	specify	PPM - 100 - λ

Please contact our sales department to obtain a price list for our standard components.

VersaLight Wire Grid Polarizers

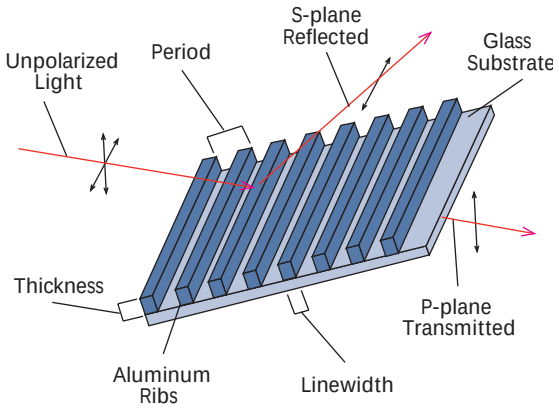


*Versa*Light is constructed of a thin layer of aluminum MicroWires® on a glass substrate and sets a new standard for applications requiring extremely high durability, contrast and a wide field of view from VIS through IR including the telecom wavelengths.

*Versa*Light offers the performance quality of dichroic sheet polarizers without the problems of thermal meltdown commonly associated with this technology.

The nature of *Versa*Light's MicroWire construction allows it to perform as an exceptional polarizing beam splitter. In operation, *Versa*Light reflects one polarization state and transmits another, both with high contrast. *Versa*Light offers the broadest band and highest field of view of any material currently available.

*Versa*Light can be shaped as needed and stacked to achieve very high extinction ratios.



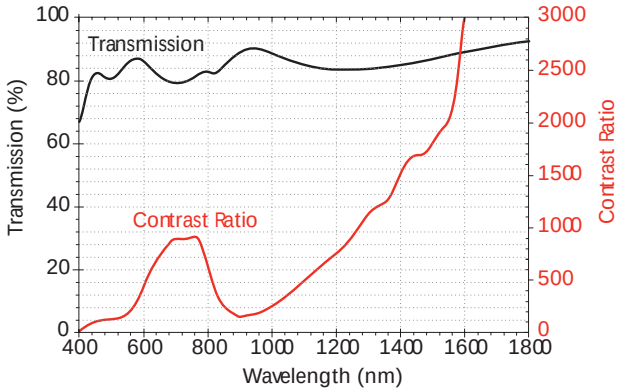


Fig. 2-8 NIR VersaLight Wire-grid Polarizer. This coating is recommended for applications requiring higher transmission from 700 nm to 1000 nm

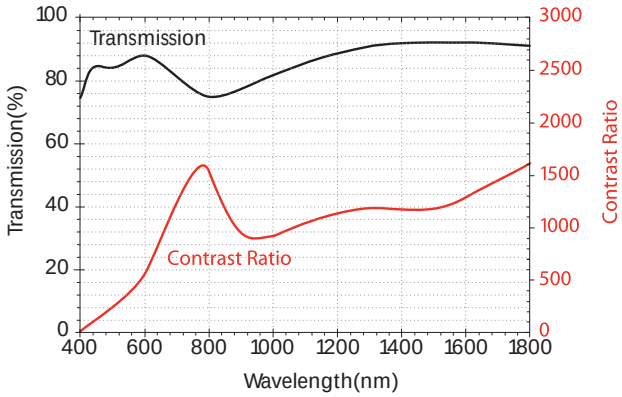


Fig. 2-9 IR VersaLight Wire-grid Polarizer.

Talk to one of our sales engineers to find out how VersaLight can work for your requirements.

MOXTEK

MicroWires is a registered trademark of MOXTEK, Inc.

Specifications

	Normal Incidence AR Coated	Normal Incidence Doubled	45° Incidence AR Coated
Typical contrast in reflection	>30:1	>30:1	>30:1
Thickness	0.7 mm	1.4 mm	0.7 mm

Transmitted Wavefront Distortion(1)	λ/2 per inch
Wavelength Range	400 nm to >2000 nm
Maximum Temperature(1)	200° C
Laser Damage Threshold(1,2)	50 KW/cm² CW
Dimensions	1.0 mm to 100 mm

(1) Applies only to single layer VersaLight
(2) Peak irradiance at 1540 nm

Ordering Information

Standard *VersaLight*

Shape	Dimension	AR Coating	Part Number
square	0.5"x0.5"	NIR	VL-050-NIR-S
		IR	VL-050-IR-S
	1.0"x1.0"	NIR	VL-100-NIR-S
		IR	VL-100-IR-S
round	0.5" diameter	NIR	VL-050-NIR-R
		IR	VL-050-IR-R
	1.0" diameter	NIR	VL-100-NIR-R
		IR	VL-100-IR-R

Call for information on your custom size or on doubled assemblies.

UV *VersaLight*

Meadowlark introduces a UV *VersaLight* polarizer on a fused silica substrate. Unlike our standard *VersaLight* polarizers, the UV polarizer cannot be overcoated with a protective coating and must remain immersed in air. We place a protective fused silica plate over the wire grid polarizer. We can also replace the protective plate with a second UV *VersaLight* polarizer to improve the contrast ratio of the polarizer. Call us for full specifications and information on custom designs.

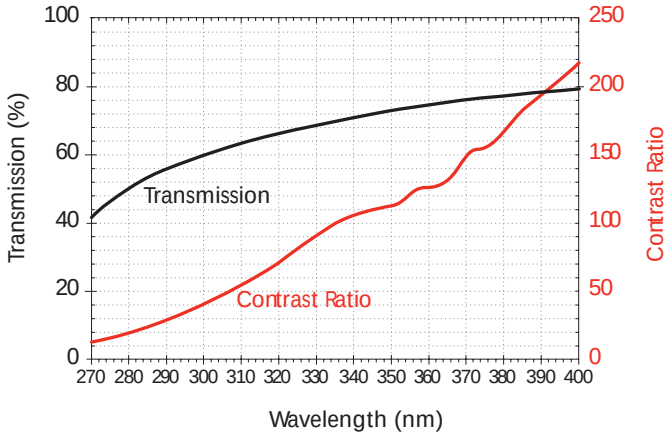


Fig. 2-10 Doubled UV VersaLight Polarizer with fused silica substrates. These data curves are taken for 2 VersaLight plates placed faced to face with an air-spaced gap

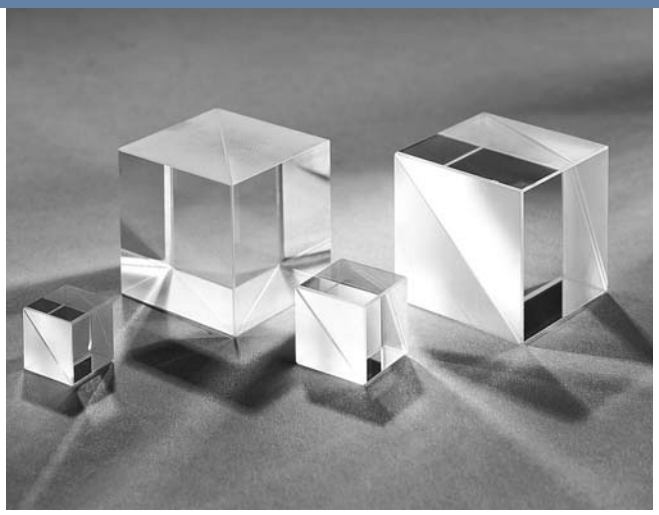
Ordering Information

Standard UV *VersaLight* Assembly

Shape	Dimension	Clear Aperture	Part Number
square	1.0"x1.0"	> 0.5"x0.5"	VL-100-UV-S

Contact Meadowlark Optics to discuss your requirements for VersaLight Polarizers.

Laser Line Beamsplitting Polarizers



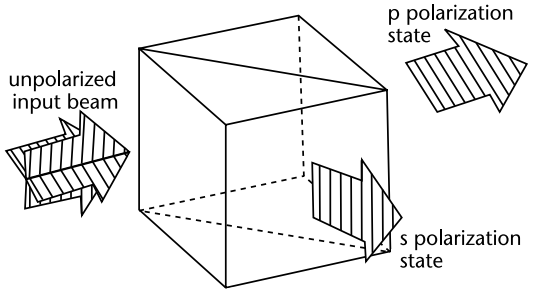


Fig. 2-8 Beamsplitting polarizers provide two orthogonally polarized beams, conveniently separated by 90°.

Meadowlark Optics' right angle prisms are matched in pairs to produce high quality laser line beamsplitting polarizers with superior wavefront quality in both transmission and reflection.

The hypotenuse face of one prism is coated with a multilayer dielectric beamsplitting coating optimized for laser performance. Two prisms are cemented together, protecting the critical coating from performance-degrading environmental factors.

Each cube separates an unpolarized incident beam into two orthogonal, linearly polarized components with negligible absorption. Following the principle of pile-of-plates polarizers, *p* polarized light is transmitted while *s* polarization is reflected.

All four entrance and exit faces are coated with a V-type antireflection coating to minimize reflection losses.

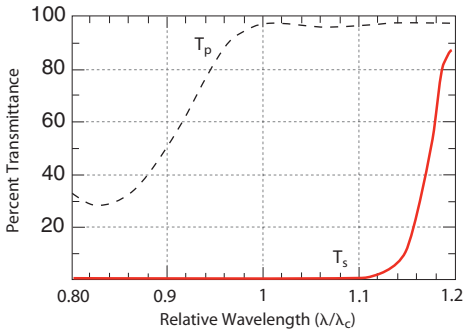


Fig. 2-9 Typical performance of a Laser Line Beamsplitting Polarizer

Laser Line Beamsplitting Polarizers

Key Benefits

- High contrast
- Low reflectance
- High damage threshold
- Low transmitted wavefront distortion

Specifications

Material:	BK-7 Grade A, fine annealed
Wavefront Distortion : (at 632.8 nm)	
Transmitted:	≤ λ/5
Reflected:	≤ λ/2
Contrast Ratio:	
Transmitted:	≥ 500:1
Reflected:	≥ 20:1
Efficiency:	
p polarized light:	≥ 95% transmitted
s polarized light:	≥ 99% reflected
Clear Aperture:	Central 80% circular
Reflectance (per surface):	0.25% at normal incidence
Surface Quality:	≤ 40-20 scratch and dig
Beam Deviation:	
Transmitted:	±3 arc min
Reflected:	±6 arc min
Acceptance Angle:	±2°
Standard Wavelengths:	532, 632.8, 670, 780, 850, 1064, and 1550 nm
Dimensional Tolerance:	±0.020 in.
Temperature Range:	-40 °C to +100 °C
Recommended Safe Operating Limit:	500 W/cm² CW 300 mJ/cm² 10 ns, visible 200 mJ/cm² 10 ns, 1064 nm

Ordering Information

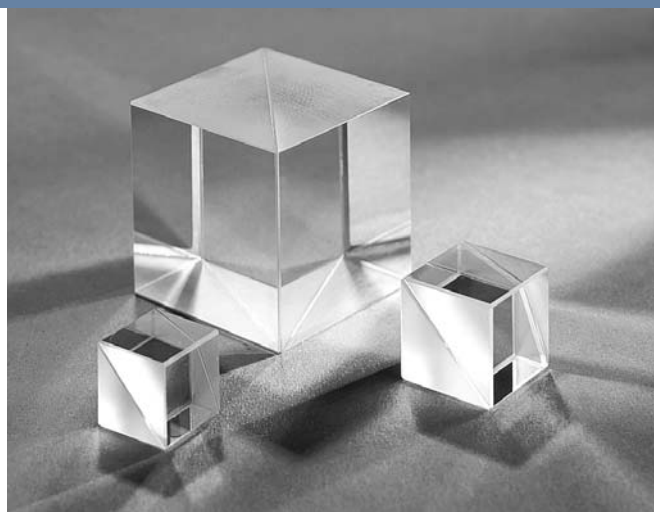
Dimensions A=B=C	Part Number
0.5 in.	BP - 050 - λ
1.0 in.	BP - 100 - λ

Please substitute your wavelength in nanometers for λ. Call us for pricing on nonstandard wavelengths or sizes.

Custom sizes and wavelengths of our Laser Line Beamsplitting Polarizers are readily available. Please call for a quote.

Please contact our sales department to obtain a price list for our standard components.

Broadband Beamsplitting Polarizers



For applications involving broadband or tunable wavelength sources, Meadowlark Optics presents a full line of Broadband Beamsplitting Polarizers covering the visible to near infrared region. These cubes offer increased utility for a range of polarization needs.

As with the Laser Line Beamsplitting Polarizers, two usable polarization forms result, conveniently separated by 90°. For unpolarized input, incident light will be equally split, 50% transmitted and reflected.

The basic construction of this polarizer line is similar to the Laser Line Beamsplitting Polarizers previously described. Our choice of high-index glass for these polarizers aids in providing such broad usable wavelength ranges. However, these broadband designs require well-collimated input and accurate angular alignment for optimum performance.

All four entrance and exit faces are antireflection coated to minimize losses.

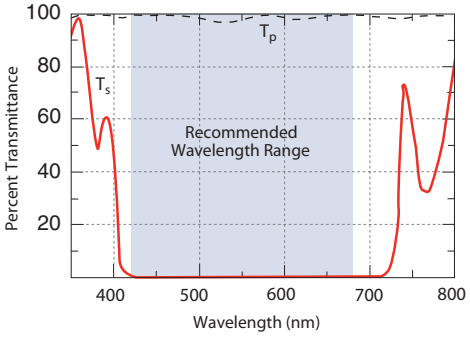


Fig. 2-10 Design Performance of Visible Broadband Beamsplitting Polarizer

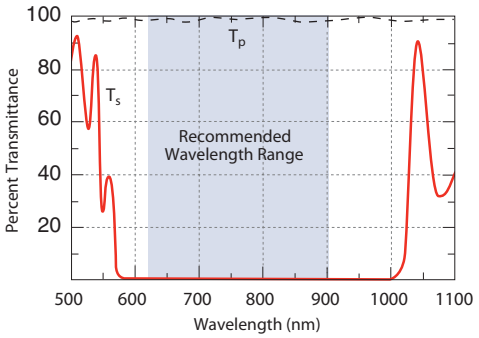


Fig. 2-11 Design Performance of IR1 Broadband Beamsplitting Polarizer

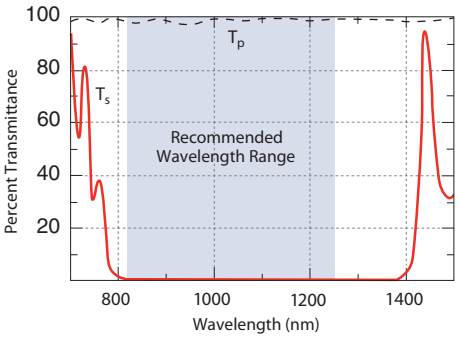


Fig. 2-12 Design Performance of IR2 Broadband Beamsplitting Polarizer

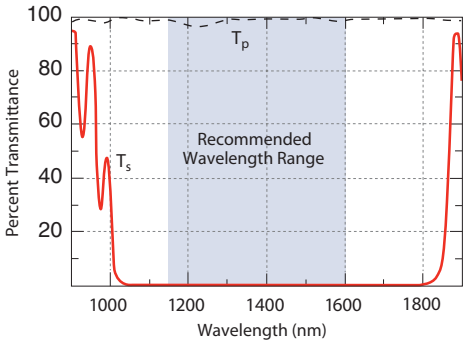


Fig. 2-13 Design Performance of IR3 Broadband Beamsplitting Polarizer

Broadband Beamsplitting Polarizers

Key Benefits

- Broad spectral range
- High contrast
- Low reflectance
- High damage threshold
- Large field of view

Specifications

Material:	SF 2
Wavefront Distortion (at 632.8 nm):	
Transmitted:	≤ λ/5
Reflected:	≤ λ/2
Contrast Ratio:	
Transmitted:	≥ 500:1
Reflected:	≥ 20:1
Efficiency (Average over wavelength range):	
p polarized light:	≥ 95% transmitted
s polarized light:	≥ 98% reflected
Clear Aperture:	Central 80% circular
Reflectance (per surface):	≤ 0.5% average at normal incidence
Surface Quality:	40-20 scratch and dig
Beam Deviation:	
Transmitted:	±3 arc min
Reflected:	±6 arc min
Acceptance Angle:	±2°
Wavelength Range:	
Visible:	440-680 nm
Near IR1:	620-900 nm
Near IR2:	820-1250 nm
Near IR3:	1150-1600 nm
Dimensional Tolerance:	±0.020 in.
Temperature Range:	-40 °C to +100 °C
Recommended Safe Operating Limit:	500 W/cm² CW 300 mJ/cm² 10 ns, visible 200 mJ/cm² 10 ns, 1064 nm

Ordering Information

Dimensions A=B=C	Part Number
Visible (440-680 nm)	
0.5 in.	BB - 050 - VIS
1.0 in.	BB - 100 - VIS
Near IR1 (620-900 nm)	
0.5 in.	BB - 050 - IR1
1.0 in.	BB - 100 - IR1
Near IR2 (820-1250 nm)	
0.5 in.	BB - 050 - IR2
1.0 in.	BB - 100 - IR2
Near IR3 (1150-1600 nm)	
0.5 in.	BB - 050 - IR3
1.0 in.	BB - 100 - IR3

Please contact our sales department to obtain a price list for our standard components.

Glan-Thompson Polarizers

Calcite is a naturally occurring birefringent crystal. By precisely controlling internal prism angles in all of our calcite polarizers, a very efficient linear polarizer is produced.

Meadowlark Optics offers Glan-Thompson Polarizers, intended for precision optical instrumentation and low power laser applications. Key advantages of Glan-Thompson Polarizers include excellent extinction ratio performance and a broad spectral range.

Our Glan-Thompson Polarizers are supplied in a black anodized cylindrical housing for easy mounting. Glan-Thompson Polarizers are suitable for use from 320-2300 nm.

Three multilayer broadband antireflection coating options cover the visible to near infrared range. Uncoated Glan-Thompson Polarizers are also available.

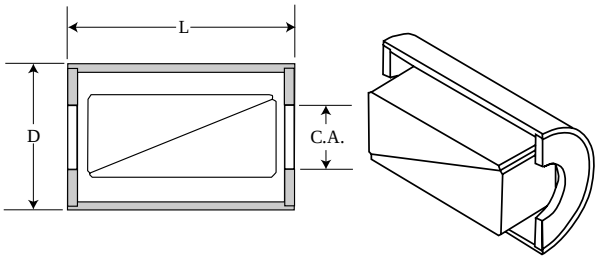


Fig. 2-14 Glan-Thompson Polarizer construction
L= 1.25", D= 0.875"

Key Benefits

- Excellent extinction ratio
- Broad spectral range

Specifications

Material:	Grade A Optical Calcite
Extinction Ratio:	10^{-5} over central 2/3 of clear aperture
Reflectance (per surface):	
Single layer MgF2:	≈1.5% at normal incidence
Uncoated:	4.5% at normal incidence
Beam Deviation:	± 3 arc min
Acceptance Angle:	± 5°
Wavelength Range:	320-2300 nm
Recommended Safe Operating Limit:	25-30 W/cm^2 CW

Ordering Information

Clear Aperture(mm)	Wavelength Range	AR Coating	Part Number
10.0	320-2300 nm	None	GTP-M10-UNC
10.0	400-700 nm	BBAR	GTP-M10-0550
10.0	650-1000 nm	BBAR	GTP-M10-0850
10.0	1000-1500 nm	BBAR	GTP-M10-1250

Custom sizes of our Glan-Thompson Polarizers are available. Call for a quote.

Please contact our sales department to obtain a price list for our standard components.

Optical Isolation with Circular Polarizers

Circular polarizers transmit either left circular polarized light or right-circular polarized light for an input beam of any polarization state.

When circularly polarized light is reflected, its propagation direction reverses, changing left-circular polarization to right-circular polarization and vice-versa. Therefore the same polarizer that produces circular polarization of the incident beam will block the return beam.

Achievement of optical isolation using the circular polarizers described in this catalog requires that the reflection be specular and that no significant depolarization or polarization modification occur by any intervening medium between the reflector and optical isolator.

We offer circular polarizers in two basic designs, each for use in air:

- Dichroic Polarizer/Zero-Order Retarder
- Beamsplitting Polarizer/Zero-Order Retarder

Both designs take advantage of the handedness change of a circularly polarized beam upon reflection. Again, by changing the handedness of the circularly polarized beam, back reflections are blocked by the polarizer.

The degree of this blocking is commonly used to evaluate circular polarizer performance. Termed "isolation", it can be considered similar to the extinction ratio specification of a linear polarizer.

Isolation represents the percentage of an incident beam which is blocked on its second pass through the circular polarizer. High isolation implies less light will be returned to the source.

A more detailed description of the characteristics of circularly polarized light is provided in *Polarized Light in Optics and Spectroscopy*. This reference (and others) can be found on page 3.

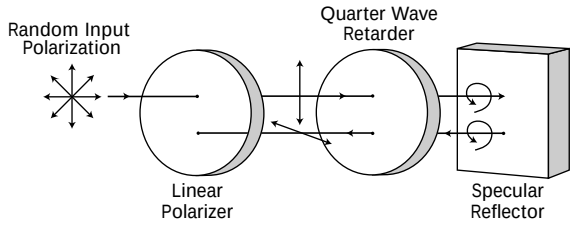


Fig. 2-15 Optical isolation using a circular polarizer

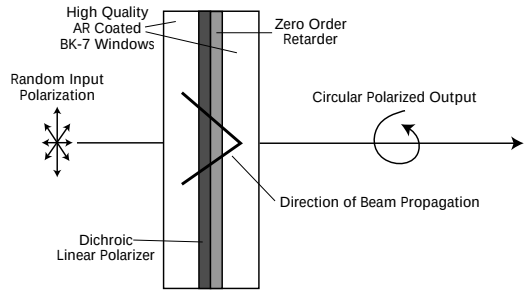


Fig. 2-16 Dichroic Circular Polarizer construction

Dichroic Circular Polarizers

Meadowlark Optics' Dichroic Circular Polarizers consist of a dichroic linear polarizer and true zero-order quarter wave retarder. Accurately aligning the retarder fast axis at 45° to the linear polarization direction ensures optimum performance.

True zero-order retarders (page 28) are used in the assembly of our Dichroic Circular Polarizers. Tight retardance tolerancing also contributes to the final performance.

Once aligned, both polarizer and retarder materials are laminated between high quality optical flats, providing less than λ/5 transmitted wavefront distortion. Anti-reflection coated windows ensure surface losses are minimized.

Achievement of the desired polarization effect requires proper orientation of your Dichroic Circular Polarizer. Be sure to position the indicator marking in the direction of beam propagation.

Our standard Dichroic Circular Polarizers are designed for single wavelength applications. Achromatic versions are also available on a custom basis. Please call for quotation assistance.

Custom sizes of our Dichroic Circular Polarizers are available. Call for a quote.

Please contact our sales department to obtain a price list for our standard components.

Key Benefits

- High isolation
- Low transmitted wavefront distortion
- Large diameters available

Specifications

Polarizer Material:	Dichroic Polymer
Retarder Material:	Birefringent polymer
Substrate Material:	BK-7 Grade A, fine annealed
Standard Wavelengths:	532, 632.8, 670, 780, 850, 1064, and 1550 nm
Isolation:	99.8%
Transmitted Wavefront Distortion (PV at 632.8 nm):	≤ λ/5 VIS, ≤ λ/2 NIR
Surface Quality:	≤ 40-20 scratch and dig
Beam Deviation:	≤ 1 arc min VIS ≤ 2 arc min NIR
Reflectance (per surface):	0.5%
Diameter Tolerance:	
Mounted:	±0.005 in.
Unmounted:	+0/-0.010 in.
Temperature Range:	-20 8C to +50 8C
Recommended Safe Operating Limit:	1 W/cm² CW

Prolonged exposure to strong ultraviolet radiation may damage these polarizers.

Ordering Information

Diameter D (in.)	Clear Aperture (in.)	Thickness t (in.)	Part Number
Mounted			
1.00	0.40	0.23	CPM - 050 - λ
1.00	0.70	0.35	CPM - 100 - λ
2.00	1.20	0.50	CPM - 200 - λ
Unmounted			
0.50	0.40	0.13	CP - 050 - λ
1.00	0.80	0.25	CP - 100 - λ

Meadowlark Optics standard Dichroic Circular Polarizers provide left-hand circular output. Please call to request a quote for right-hand circular output.

Beam Separators

Key Benefits

- High isolation
- Low transmitted wavefront distortion

Specifications

Material:	BK-7 Grade A, fine annealed
Transmitted Wavefront Distortion (at 632.8 nm):	≤ λ/5
Reflected Wavefront Distortion (at 632.8 nm):	≤ λ/2
Clear Aperture:	Central 80% circular
Reflectance (per surface):	0.25%
Surface Quality:	≤ 40-20 scratch and dig
Beam Deviation:	±3 arc min
Acceptance Angle:	±2°
Standard Wavelengths:	532, 632.8, 670, 780, 850, 1064, and 1550 nm
Dimensional Tolerance:	±0.020 in.
Temperature Range:	-20 °C to +50 °C
Recommended Safe Operating Limit:	500 W/cm² CW 300 mJ/cm² 10 ns, visible 200 mJ/cm² 10 ns, 1064 nm

Ordering Information

Cube Dimensions	Part Number
Beam Separators	
0.5 in.	BS - 050 - λ
1.0 in.	BS - 100 - λ

Please substitute your wavelength in nanometers for λ.
Call us for pricing on custom wavelengths or sizes.

Please contact our sales department to obtain a price list for our standard components.

Beam Separators

Meadowlark Optics' Beam Separators are specially designed for laser line applications. Assembly consists of a true zero-order quarter-wave retarder (page 29) oriented with its fast axis at 45° to the horizontal (transmission) axis of a Laser Line Beamsplitting Polarizer (page 12). The transmitted beam is circularly polarized, regardless of the input beam polarization state.

Our true zero-order Precision Retarders measure one quarter-wave within ±λ/350 waves. Aligning the fast axis to within 1° ensures greater than 99.8% source isolation from specular back reflections.

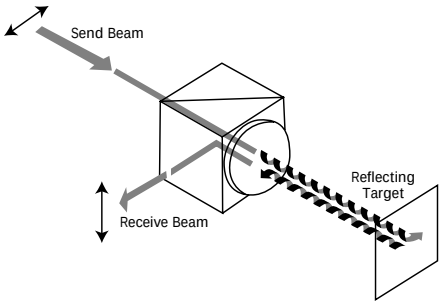


Fig. 2-17 Beam Separator

Meadowlark Optics' standard beam separators provide left-hand circular output. Right-hand circular output is available. Call for a quote.