

Optical Component Catalog

OEM and Prototype Manufacturing

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Waveplates

- Crystal Quartz
- Mica

Windows

- Parallel
- Wedged
- Square / Rectangular



Mirrors

- Dielectric
- Metal
- Plano
- Spherical

Lenses

Prisms



Beamsplitters

- Cube
- Plate

Polarizers

- Cube
- Plate



Welcome to OptiSource, LLC

A letter from our GM

We appreciate the opportunity to showcase our products for you and look forward to providing the solution to your component needs.

After familiarizing yourself with our services and product offerings, we hope your next step will be to place an order with our company. We believe you will become another of a growing number of satisfied customers partnering with OptiSource, LLC, currently in our second decade of operations.

OptiSource, LLC is a small manufacturer of prototype and OEM quantities of optical components. Because of our size, we are able to incorporate many of the advantages and amenities associated with a larger company (i.e. a wide array of in-stock inventory) without the downside of dealing with the bureaucracies inherent in big companies.

The OptiSource staff is knowledgeable—150+ years of experience in all facets of sales, coating, fabrication and assembly of precision optical components.

Our smaller size affords us the advantage of maintaining a low overhead. Low overhead plus a skilled staff that multi-tasks, equals significant cost savings that we pass along to our customers.

We have developed a level of flexibility in our manufacturing environment not usually found in a larger company. This flexibility allows our manufacturing team to respond to your individual needs more effectively while still maintaining our OEM schedules.

As a user or buyer, you talk directly to the people who know the status of your order. They will give you a prompt assessment of your order status.

Having the components to successfully complete your project(s) and deliver your product is a direct measure of our performance. Place your order. Give us a chance to partner with you. You'll be convinced of our commitment to your success.

Thank you,

Greg Woodhouse
General Manager
OptiSource, LLC

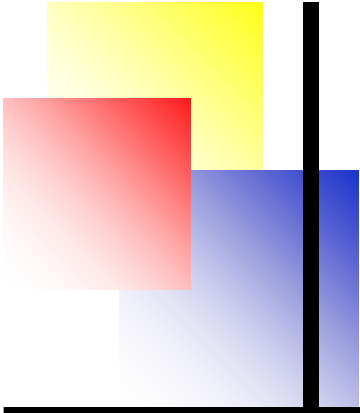
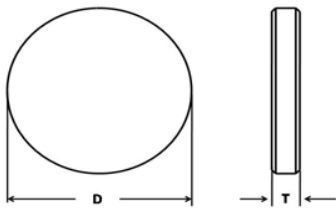


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Plane Windows

Product Code: PW



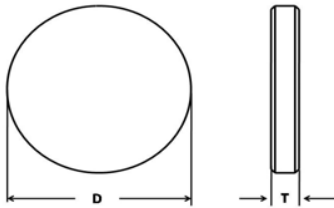
Substrate Materials: UV Fused Silica, BK-7
 Diameter Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Thickness Tolerance: +/-0.010" [+/-0.25mm]
 Surface Quality: 10-5 Per ANSI/OESC OP1.002-2006
 Parallelism: ≤ 5 arc minutes
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: ≥ central 85% of diameter

- OptiSource Plane Windows (PW) are available as coated or uncoated optics.
- To select a coating, please see our coating offerings beginning on catalog page 36.
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Part Number	Diameter (mm) "D"	Thickness (mm) "T"	Surface Figure	Surface Quality	Substrate Material
PW-0512-XX	12.70	3.18	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-0525-XX	12.70	6.35	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-0537-XX	12.70	9.53	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-1004-XX	25.40	1.00	$\lambda/4$ @ 633nm	10-5	UV,BK-7
PW-1012-XX	25.40	3.18	$\lambda/4$ @ 633nm	10-5	UV,BK-7
PW-1025-XX	25.40	6.35	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-1037-XX	25.40	9.53	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-1525-XX	38.10	6.35	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-1537-XX	38.10	9.53	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-2025-XX	50.80	6.35	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-2037-XX	50.80	9.53	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-3037-XX	76.20	9.53	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-3050-XX	76.20	12.70	$\lambda/10$ @ 633nm	10-5	UV,BK-7
PW-4050-XX	101.60	12.70	$\lambda/10$ @ 633nm	10-5	UV,BK-7

Plane Parallel Windows

Product Code: PW1



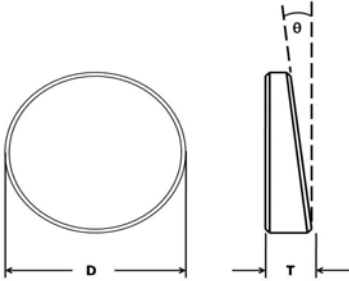
Substrate Materials: UV Fused Silica, BK-7
 Diameter Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Thickness Tolerance: +/-0.010" [+/-0.25mm]
 Surface Quality: 10-5 Per ANSI/OESC OP1.002-2006
 Parallelism: ≤ 10 arc seconds
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: ≥ central 85% of diameter

- OptiSource Plane Parallel Windows (PW1) are available as coated or uncoated optics.
- To select a coating, please see our coating offerings beginning on catalog page 36.
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Part Number	Diameter (mm) "D"	Thickness (mm) "T"	Surface Figure	Surface Quality	Substrate Material
PW1-0525-XX	12.70	6.35	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-0537-XX	12.70	9.53	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-1012-XX	25.40	3.18	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-1025-XX	25.40	6.35	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-1037-XX	25.40	9.53	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-1525-XX	38.10	6.35	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-1537-XX	38.10	9.53	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-2025-XX	50.80	6.35	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-2037-XX	50.80	9.53	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-3037-XX	76.20	9.53	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-3050-XX	76.20	12.70	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7
PW1-4050-XX	101.60	12.70	$\lambda/10 @ 633\text{nm}$	10-5	UV,BK-7

Wedged Windows

Product Code: IF / LW



Substrate Materials: UV Fused Silica, BK-7
 Diameter Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Thickness Tolerance: +/-0.010" [+/-0.25mm]
 Surface Quality: 10-5 Per ANSI/OESC OP1.002-2006
 Wedge Tolerance: +/- 5 arc minutes
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: ≥ central 85% of diameter

- OptiSource Interferometer Flats (IF) and Large Wedges (LW) are available as coated or uncoated optics.
- To select a coating, please see our coating offerings beginning on catalog page 36.
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Interferometer Flats — Product Code: IF

Part Number	Diameter (mm) "D"	Thickness (mm) "T"	Wedge	Surface Figure	Surface Quality	Substrate Material
IF-1025-XX	25.40	6.35	30'	$\lambda/10$ @ 633nm	10-5	UV,BK-7
IF-1037-XX	25.40	9.53	30'	$\lambda/10$ @ 633nm	10-5	UV,BK-7
IF-2025-XX	50.80	6.35	30'	$\lambda/10$ @ 633nm	10-5	UV,BK-7
IF-2037-XX	50.80	9.53	30'	$\lambda/10$ @ 633nm	10-5	UV,BK-7
IF-3050-XX	76.20	12.70	30'	$\lambda/10$ @ 633nm	10-5	UV,BK-7
IF-4050-XX	101.60	12.70	30'	$\lambda/10$ @ 633nm	10-5	UV,BK-7

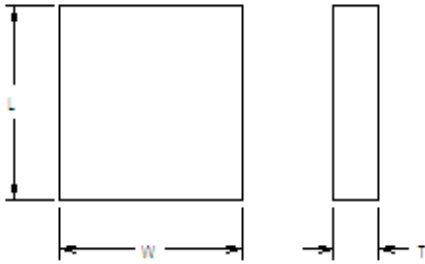
Large Wedged Windows — Product Code: LW

Part Number	Diameter (mm) "D"	Thickness (mm) "T"	Wedge	Surface Figure	Surface Quality	Substrate Material
LW-X-1025-XX	25.40	6.35	1°, 2°, 3°	$\lambda/10$ @ 633nm	10-5	UV,BK-7
LW-X-1037-XX	25.40	9.53	1°, 2°, 3°	$\lambda/10$ @ 633nm	10-5	UV,BK-7
LW-X-2037-XX	50.80	9.53	1°, 2°, 3°	$\lambda/10$ @ 633nm	10-5	UV,BK-7
LW-X-3050-XX	76.20	12.70	1°, 2°, 3°	$\lambda/10$ @ 633nm	10-5	UV,BK-7

*Please specify the amount of wedge in degrees when ordering a Large Wedge Window –i.e. LW-3-1037-UV would indicate a 1.00"Ø x 0.375" fused silica window with a wedge of 3 degrees.

Square / Rectangular Windows

Product Code: SQW / RW



Substrate Materials: UV Fused Silica, BK-7
 Dimension Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Thickness Tolerance: +/-0.010" [+/-0.25mm]
 Surface Quality: 10-5 Per ANSI/OESC OP1.002-2006
 Parallelism: ≤ 5 arc minutes
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: ≥ central 85% of diameter

- OptiSource Square (SQW) / Rectangular (RW) are available as coated or uncoated optics.
- To select a coating, please see our coating offerings beginning on catalog page 36.
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Square Windows — Product Code: SQW

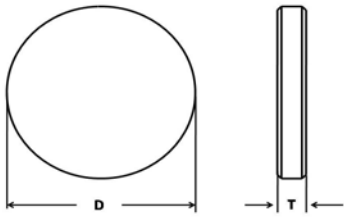
Part Number	Length (mm) "L"	Width (mm) "W"	Thickness (mm) "T"	Surface Figure	Surface Quality	Substrate Material
SQW-0525-XX	12.70	12.70	6.35	λ/10 @ 633nm	10-5	UV,BK-7
SQW-1025-XX	25.40	25.40	6.35	λ/10 @ 633nm	10-5	UV,BK-7
SQW-1037-XX	25.40	25.40	9.53	λ/10 @ 633nm	10-5	UV,BK-7
SQW-2037-XX	50.80	50.80	9.53	λ/10 @ 633nm	10-5	UV,BK-7

Rectangular Windows — Product Code: RW

Part Number	Length (mm) "L"	Width (mm) "W"	Thickness (mm) "T"	Surface Figure	Surface Quality	Substrate Material
RW-28.6-14.3-3.18-XX	28.60	14.30	3.18	λ/4 @ 633nm	10-5	UV,BK-7
RW-40.0-30.0-5.00-XX	40.00	30.00	5.00	λ/10 @ 633nm	10-5	UV,BK-7

Solid Etalons

Product Code: ET



Substrate Materials: UV Fused Silica (Suprasil or Infrasil available on request)

Diameter Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]

Thickness Tolerance: +/-0.010" [+/-0.25mm]

*For Thicknesses ≤0.70mm Thickness Tolerance : +/- 5% of Nominal

Surface Quality: 10-5 Per ANSI /OESC OP1.002-2006

Transmitted Wavefront: $\lambda/10$ @ 633nm over clear aperture

Parallelism: ≤ 1 arc second

Chamfer: 0.38mm @ 45° typical

Clear Aperture: ≥ central 85% of diameter

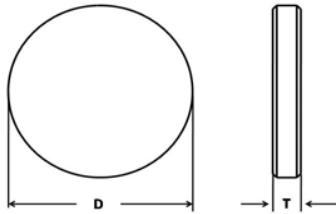
- OptiSource Solid Etalons (ET) are available as coated or uncoated optics.
- To select a coating, please see our coating offerings beginning on catalog page 36.
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Solid Etalons — Product code: ET

Part Number	Diameter (mm) "D"	Thickness (mm) "T"	Surface Quality	Substrate Material
ET-10-0.10-UV	25.40	0.10	10-5	UV
ET-10-0.25-UV	25.40	0.25	10-5	UV
ET-10-0.30-UV	25.40	0.30	10-5	UV
ET-10-0.50-UV	25.40	0.50	10-5	UV
ET-10-0.70-UV	25.40	0.70	10-5	UV
ET-10-1.00-UV	25.40	1.00	10-5	UV
ET-10-1.50-UV	25.40	1.50	10-5	UV
ET-10-2.00-UV	25.40	2.00	10-5	UV
ET-10-3.00-UV	25.40	3.00	10-5	UV
ET-10-4.00-UV	25.40	4.00	10-5	UV
ET-10-5.00-UV	25.40	5.00	10-5	UV
ET-10-6.00-UV	25.40	6.00	10-5	UV
ET-10-7.00-UV	25.40	7.00	10-5	UV
ET-10-8.00-UV	25.40	8.00	10-5	UV
ET-10-10.00-UV	25.40	10.00	10-5	UV
ET-10-10.50-UV	25.40	10.50	10-5	UV
ET-10-15.00-UV	25.40	15.00	10-5	UV

Plane Mirrors

Product Code: PM



Substrate Materials: UV Fused Silica, BK-7, Zerodur™
 Diameter Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Thickness Tolerance: +/-0.010" [+/-0.25mm]
 Surface Quality Side 1: 10-5 Per ANSI/OESC OP1.002-2006
 Surface Quality Side 2: Commercial Polish
 Parallelism: ≤ 5 arc minutes
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: ≥ central 85% of diameter

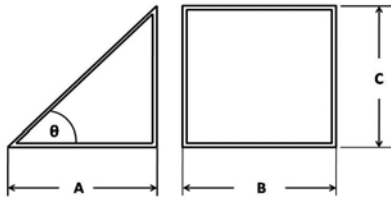
- Plane Mirrors (PM) are available as coated or uncoated optics.
- To select a coating, please see our coating offerings beginning on catalog page 36.
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Plane Mirrors — Product Code: PM

Part Number	Diameter (mm) "D"	Thickness (mm) "T"	Surface Figure	Surface Quality	Substrate Material
PM-0525-XX	12.70	6.35	λ/10 @ 633nm	10-5	UV,BK-7
PM-0537-XX	12.70	9.53	λ/10 @ 633nm	10-5	UV,BK-7
PM-1025-XX	25.40	6.35	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-1037-XX	25.40	9.53	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-1525-XX	38.10	6.35	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-1537-XX	38.10	9.53	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-2025-XX	50.80	6.35	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-2037-XX	50.80	9.53	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-3050-XX	76.20	12.70	λ/10 @ 633nm	10-5	UV,BK-7,Zer
PM-4050-XX	101.60	12.70	λ/10 @ 633nm	10-5	UV,BK-7,Zer

Right Angle Prisms

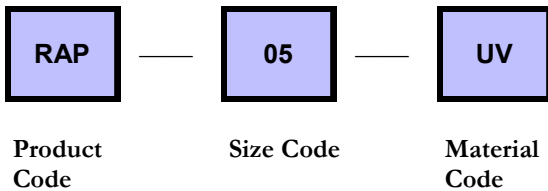
Product Code: RAP



Dimensional Tolerance: $+0.000 / -0.010''$ [$+0.00 / -0.25\text{mm}$]
 Angular Tolerance: < 3 arc minutes
 Clear Aperture: $>85\%$ of central dimension
 Chamfer: 0.38mm @ 45° typical

- Standard Right Angle Prisms (RAP) are uncoated.
- Non-standard prisms are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Size Codes

04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
15: 38.1mm
20: 50.8mm

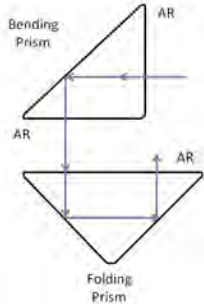
Material Codes

BK
UV



Bending/ Folding Prisms

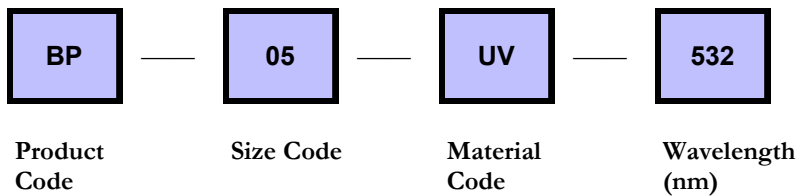
Product Code: BP / FP



Dimensional Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Angular Tolerance: < 3 arc minutes
 Clear Aperture: >85% of central dimension
 Chamfer: 0.38mm @ 45° typical

- Standard Bending Prisms (BP) are AR coated on both legs at the customer specified wavelength.
- Standard Folding Prisms (FP) are AR coated on the hypotenuse at the customer specified wavelength.
- Non-standard bending and folding prisms are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Product Code

BP: Bending Prism
FP: Folding Prism

Size Codes

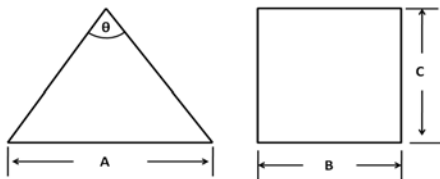
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
15: 38.1mm
20: 50.8mm

Material Codes

BK
UV

Brewster's Dispersing Prisms

Product Code: BDP



Dimensional Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Angular Tolerance: < 3 arc minutes
 Clear Aperture: >85% of central dimension
 Chamfer: 0.38mm @ 45° typical

Part Number	Material	A	B	Brewster's Angle
BDP-05-UV	UV Fused Silica	12.7mm	12.7mm	69.06°
BDP-06-UV	UV Fused Silica	15.0mm	15.0mm	69.06°
BDP-06-SF10	SF-10	15.0mm	15.0mm	60.60°
BDP-10-SF10	SF-10	25.0mm	25.0mm	60.60°

Equilateral Dispersing Prisms

Product Code: EDP

Part Number	Material	A=B=C	Apex Angle
EDP-06-BK	BK-7	15.0mm	60°
EDP-08-BK	BK-7	20.0mm	60°
EDP-10-BK	BK-7	25.0mm	60°
EDP-12-BK	BK-7	30.0mm	60°
EDP-16-BK	BK-7	40.0mm	60°
EDP-24-BK	BK-7	60.0mm	60°
EDP-12-F2	F2	30.0mm	60°
EDP-24-F2	F2	60.0mm	60°
EDP-12-SF10	SF-10	30.0mm	60°
EDP-24-SF10	SF-10	60.0mm	60°



Waveplates

Multiple-Order Waveplates: Multiple-Order Waveplates are the least expensive option in quartz waveplates for polarization control. Multiple-Order Waveplates are wavelength and polarization specific. This product is more susceptible to polarization shift due to thermal expansion. Standard multiple order inventory at OptiSource is modeled on thicknesses of 0.400-0.600mm for pieces 10.00-30.00mmØ.

Zero-Order Waveplates: Zero-Order Waveplates are comprised of two pieces of crystal quartz with the optical axes assembled at 90° to one another. OptiSource utilizes three assembly processes for Zero-Order Waveplates. Standard OptiSource compound Zero-Order Waveplates are optically contacted. Please specify if you wish have your compound Zero-Order Waveplates assembled via another method such as air-spaced or glued. Zero-Order Waveplates are more resistant to polarization shift due to thermal variations in the work environment.

Low-Order Waveplates: Low-Order Waveplates range in thickness from 0.100-0.250mm. This product line provides improved stability against polarization shift due to thermal expansion in a single (multiple order) element format. Because of the reduced thickness, Low-Order Waveplates can also be used in femto-second applications without significant pulse elongation, while still being thick enough for easy handling.

Ultra-Thin Waveplates: Ultra-Thin Waveplates range in thickness from 0.040mm(40µ) - 0.099mm(99µ). Ultra-thin Waveplates are “stand-alone” in configuration, and depending on wavelength and desired retardation can many times serve as a single piece zero-order waveplate. Waveplates in this “stand-alone” configuration should be more effective in femto-second applications as the minimal thickness will lessen the elongation of the pulse. It must be noted that Ultra-thin Waveplates are extremely difficult to handle.

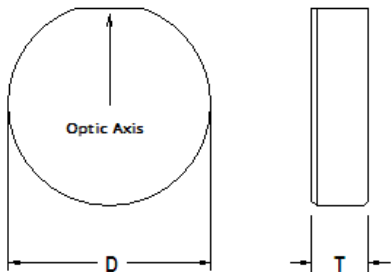
Dual-Order Waveplates: Dual-Order Waveplates are designed to function coincidentally at more than one specific wavelength and polarization. OptiSource, LLC designs Dual-Order Waveplates to meet standard retardation specifications. In the event that the design is unable to achieve standard specifications, OptiSource will ask the customer to define the wavelength and retardation for which the design should be optimized. Please be aware that many times the only coincident thickness occurs at significantly higher orders than standard OptiSource designs for standard Multiple-Order Waveplates.

Compound Dual-Order Waveplates: As previously mentioned, Dual-Order Waveplate design might entail thicknesses of such high order that retardation degradation becomes an issue due to thermal shift. OptiSource offers our “Compound Dual-Order Waveplate” to provide a thermally stable component when the application dictates the need .

Achromatic Waveplates: Achromatic Waveplates are comprised of two different birefringent materials, magnesium fluoride and crystal quartz. The combination of these two materials assembled in either an air-spaced or cemented configuration, allows for higher quality polarization values over a broader spectral region than a quartz Zero-Order Waveplate. OptiSource provides achromatic waveplates for four different bandwidths over the visible to the near IR regions. These are 450-650nm, 550-750nm, 650-1100nm, and 1050-1500nm.

Multiple-Order Waveplates

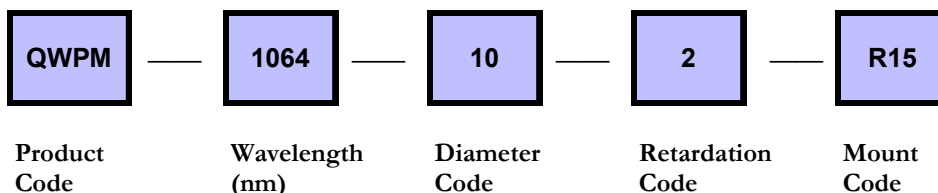
Product Code: QWPM



Substrate Material: Crystal Quartz
 Diameter Tolerance: +0.000/-0.010" [+0.00/-0.25mm]
 Standard Thickness Range: 0.250-1.50mm
 Transmitted Wavefront Distortion: $\lambda/10$ @ 632.8nm over clear aperture
 Surface Quality: 10-5
 Parallelism: ≤ 0.5 arc seconds
 Clear Aperture: \geq central 85% of diameter
 Retardation Tolerance: $\lambda/100$ - $\lambda/600$ typical (wavelength dependent)
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Multiple-Order Waveplates (QWPM) are available coated or uncoated, with or without anodized aluminum mounts.
- Customer specified antireflection coatings are available, beginning on catalog page 38.
- Non-standard dimensions, shapes and wavelengths are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Standard Wavelengths (nm)

248.0	257.0	266.0	308.0	354.7
400.0	405.0	488.0	514.5	532.0
632.8	670.0	694.3	780.0	800.0
810.0	1030.0	1047.0	1053.0	1064.0
1315.0	1319.0	1550.0		

Standard Diameter Codes

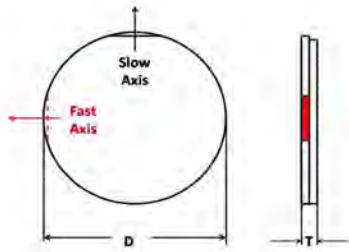
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

Standard Mount Codes

R10: 25.4mm OD
R15: 38.1mm OD
R20: 50.8mm OD
R30: 76.2mm OD

Zero-Order Waveplates

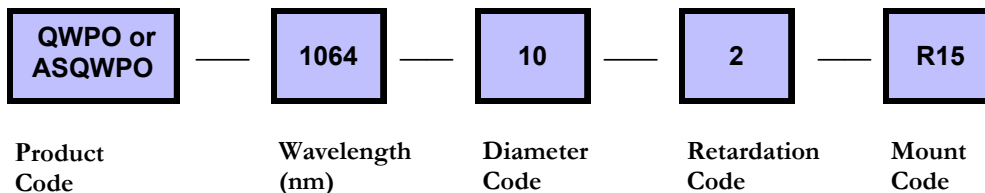
Product Code: QWPO / ASQWPO



Substrate Material: Crystal Quartz
 Diameter Tolerance: +0.000/-0.010" [+0.00/-0.25mm]
 Standard Thickness Range: 0.80-1.60mm
 Transmitted Wavefront Distortion: $\lambda/10$ @ 632.8nm over clear aperture
 Surface Quality: 10-5
 Parallelism: ≤ 0.5 arc seconds
 Clear Aperture: \geq central 85% of diameter
 Retardation Tolerance: $\lambda/100$ - $\lambda/600$ typical (wavelength dependent)
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Zero-Order Waveplates (QWPO/ASQWPO) are available coated or uncoated; with or without anodized aluminum mounts.
- Customer specified antireflection coatings are available, beginning on catalog page 38.
- Standard Zero-Order waveplates are optically contacted, but are also available air-spaced (AS).
- Non-standard dimensions, shapes and wavelengths are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Standard Wavelengths (nm)

248.0	257.0	266.0	308.0	354.7
400.0	405.0	488.0	514.5	532.0
632.8	670.0	694.3	780.0	800.0
810.0	1030.0	1047.0	1053.0	1064.0
1315.0	1319.0	1550.0		

Standard Diameter Codes

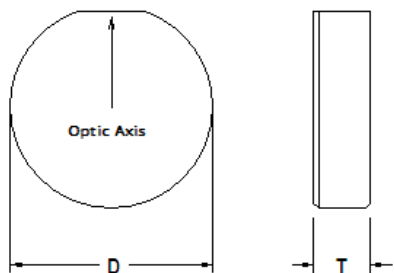
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

Standard Mount Codes

R10: 25.4mm OD
R15: 38.1mm OD
R20: 50.8mm OD
R30: 76.2mm OD

Low-Order Waveplates

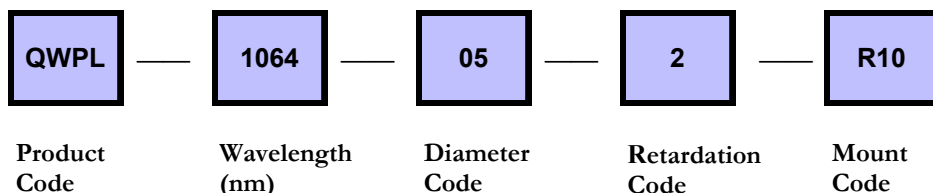
Product Code: QWPL



Substrate Material: Crystal Quartz
 Diameter Tolerance: +0.000/-0.010" [+0.00/-0.25mm]
 Standard Thickness Range: 0.100-0.250mm
 Transmitted Wavefront Distortion: $\lambda/10$ @ 632.8nm over clear aperture
 Surface Quality: 10-5
 Parallelism: ≤ 0.5 arc seconds
 Clear Aperture: \geq central 85% of diameter
 Retardation Tolerance: $\lambda/100$ - $\lambda/600$ typical (wavelength dependent)
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Low-Order Waveplates (QWPL) are available coated or uncoated; with or without anodized aluminum mounts.
- Customer specified antireflection coatings are available, beginning on catalog page 38.
- Non-standard dimensions, shapes and wavelengths are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Standard Wavelengths (nm)

248.0	257.0	266.0	308.0	354.7
400.0	405.0	488.0	514.5	532.0
632.8	670.0	694.3	780.0	800.0
810.0	1030.0	1047.0	1053.0	1064.0
1315.0	1319.0	1550.0		

Standard Diameter Codes

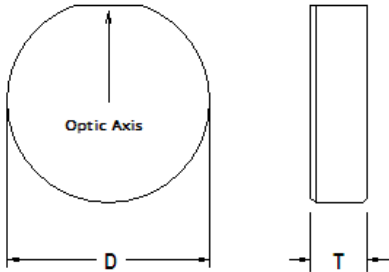
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

Standard Mount Codes

R10: 25.4mm OD
R15: 38.1mm OD
R20: 50.8mm OD
R30: 76.2mm OD

Ultra-Thin Waveplates

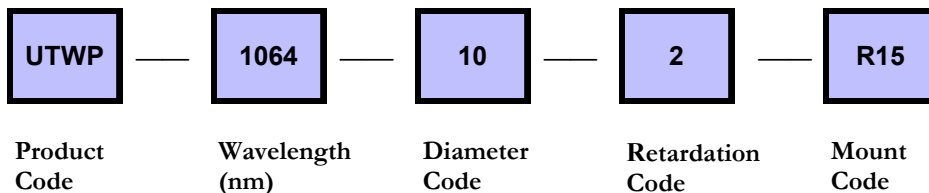
Product Code: UTWP



Substrate Material: Crystal Quartz
 Diameter Tolerance: +0.000/-0.010" [+0.00/-0.25mm]
 Standard Thickness Range: 50-100 microns
 Transmitted Wavefront Distortion: $\lambda/10$ @ 632.8nm over clear aperture
 Surface Quality: 10-5
 Parallelism: ≤ 0.5 arc seconds
 Clear Aperture: \geq central 85% of diameter
 Retardation Tolerance: $\lambda/100$ - $\lambda/600$ typical (wavelength dependent)
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Ultra-Thin Waveplates (UTWP) are available coated or uncoated; with or without anodized aluminum mounts.
- Customer specified antireflection coatings are available, beginning on catalog page 38.
- Non-standard dimensions, shapes and wavelengths are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Standard Wavelengths (nm)

248.0	257.0	266.0	308.0	354.7
400.0	405.0	488.0	514.5	532.0
632.8	670.0	694.3	780.0	800.0
810.0	1030.0	1047.0	1053.0	1064.0
1315.0	1319.0	1550.0		

Standard Diameter Codes

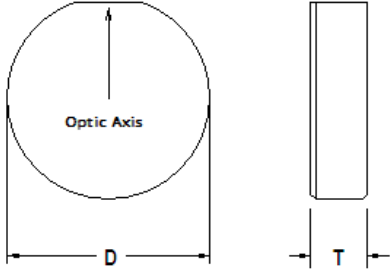
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

Standard Mount Codes

R10: 25.4mm OD
R15: 38.1mm OD
R20: 50.8mm OD
R30: 76.2mm OD

Dual-Order Waveplates

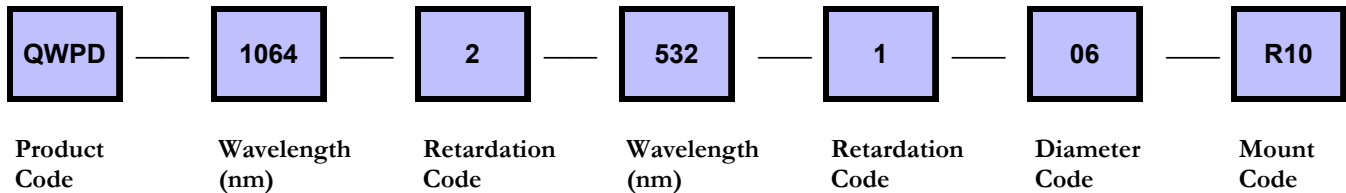
Product Code: QWPD



Substrate Material: Crystal Quartz
 Diameter Tolerance: +0.000/-0.010" [+0.00/-0.25mm]
 Standard Thickness Range: 0.100-3.00mm
 Transmitted Wavefront Distortion: $\lambda/10$ @ 632.8nm over clear aperture
 Surface Quality: 10-5
 Parallelism: ≤ 0.5 arc seconds
 Clear Aperture: \geq central 85% of diameter
 Retardation Tolerance: $\lambda/100$ - $\lambda/500$ typical (wavelength dependent)
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Dual-Order Waveplates (QWPD) are available coated or uncoated; with or without anodized aluminum mounts.
- Customer specified antireflection coatings are available, beginning on catalog page 38.
- In the event that two requested wavelengths and retardations do not allow for the design to meet standard Opti-Source retardation tolerances, the customer will be requested to optimize for one wavelength and retardation.
- Non-standard dimensions, shapes and wavelengths are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example



Standard Diameter Codes

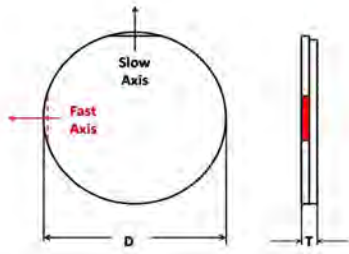
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

Standard Mount Codes

R10: 25.4mm OD
R15: 38.1mm OD
R20: 50.8mm OD
R30: 76.2mm OD

Compound Dual-Order Waveplates

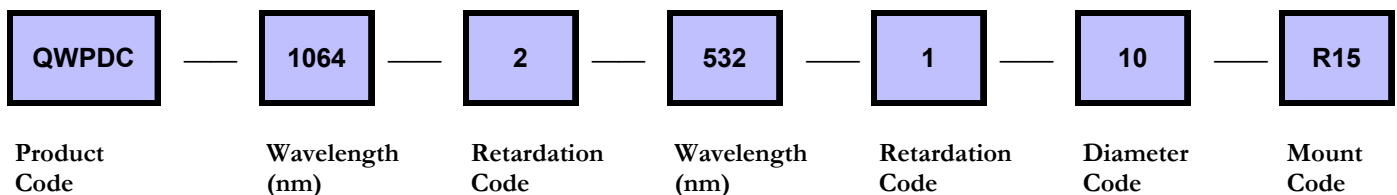
Product Code: QWPDC



Substrate Material: Crystal Quartz
 Diameter Tolerance: +0.000/-0.010" [+0.00/-0.25mm]
 Standard Thickness Range: 0.100-3.00mm
 Transmitted Wavefront Distortion: $\lambda/10$ @ 632.8nm over clear aperture
 Surface Quality: 10-5
 Parallelism: ≤ 0.5 arc seconds
 Clear Aperture: \geq central 85% of diameter
 Retardation Tolerance: $\lambda/100$ - $\lambda/500$ typical (wavelength dependent)
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Compound Dual-Order Waveplates (QWPDC) are available coated or uncoated; with or without anodized aluminum mounts.
- Customer specified antireflection coatings are available, beginning on catalog page 38.
- In the event that two requested wavelengths and retardations do not allow for the design to meet standard Opti-Source retardation tolerances, the customer will be requested to optimize for one wavelength and retardation.
- The two plate design offers more thermal stability than the single plate design.
- Non-standard dimensions, shapes and wavelengths are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Order Example

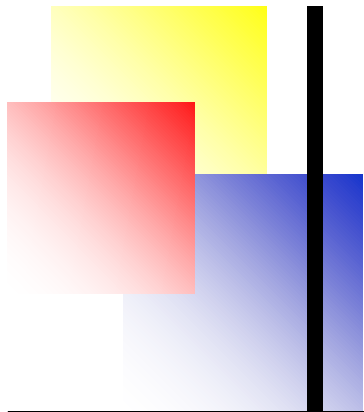


Standard Diameter Codes

04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

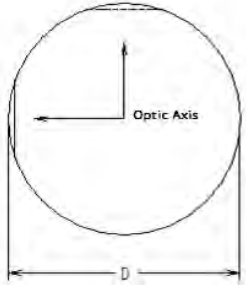
Standard Mount Codes

R10: 25.4mm OD
R15: 38.1mm OD
R20: 50.8mm OD
R30: 76.2mm OD



Achromatic Waveplates

Product Code: ACWP

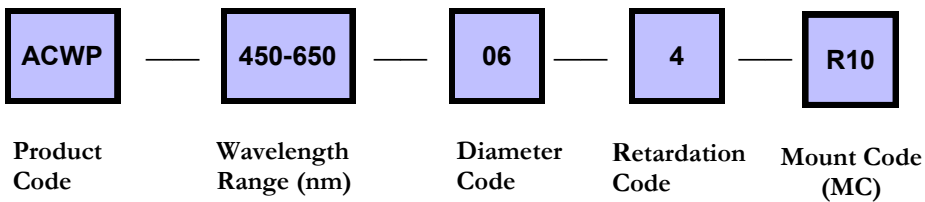


Substrate Material: Synthetic Crystal Quartz/Magnesium Fluoride
 Transmitted Wavefront Distortion: $\lambda/4$ @ 632.8nm over clear aperture
 Surface Quality: 40-20
 Retardation Tolerance: $\lambda/100$ typical

WAVELENGTH REGIONS: 450-650nm; 550-750nm, 650-1100nm, 1050-1500nm

- Achromatic Waveplates (ACWP) are BBAR coated for their respective spectral region.

Order Example

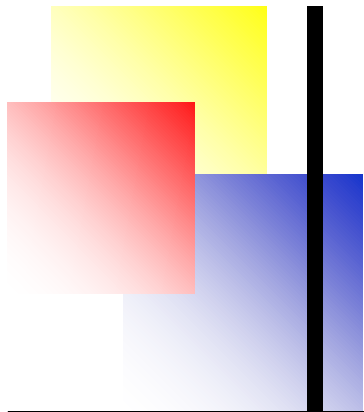


Standard Diameter Codes

06: 15.0 mm
10: 25.4 mm

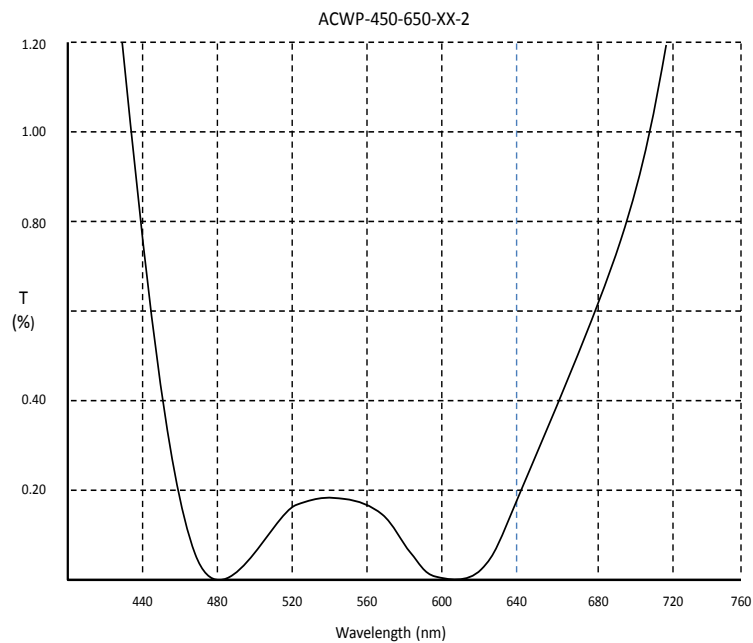
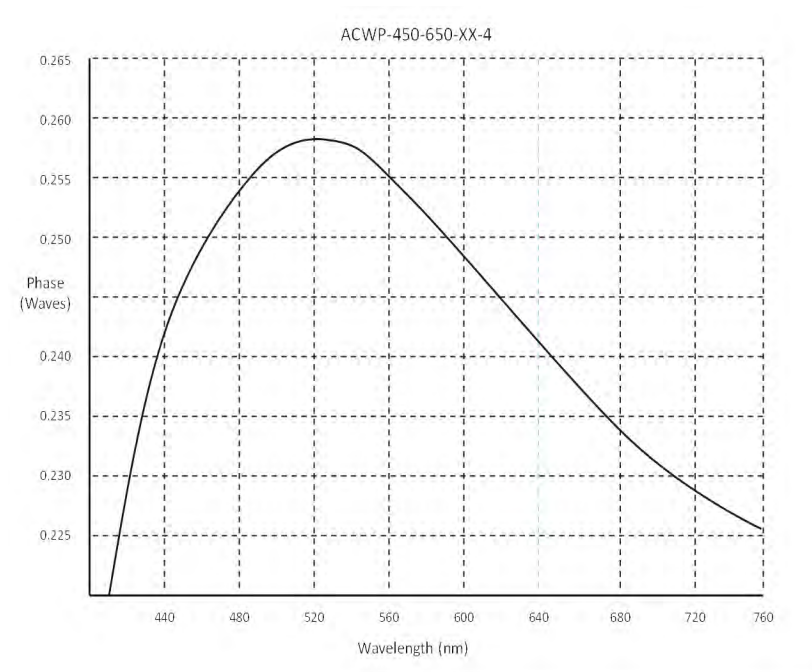
Standard Mount Sizes and CA

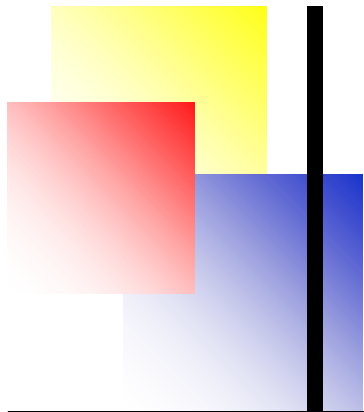
Optic Diameter (mm)	Mount diameter and length (mm)	CA (mm)	MC
15.0	25.4 x 6.35	12.8	R10
25.4	30.0 x 6.35	21.6	R12



Achromatic Waveplates

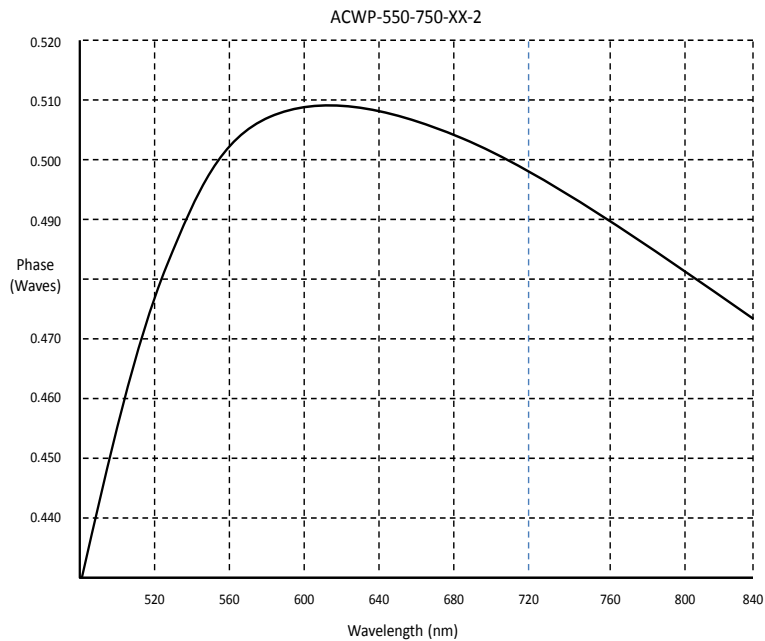
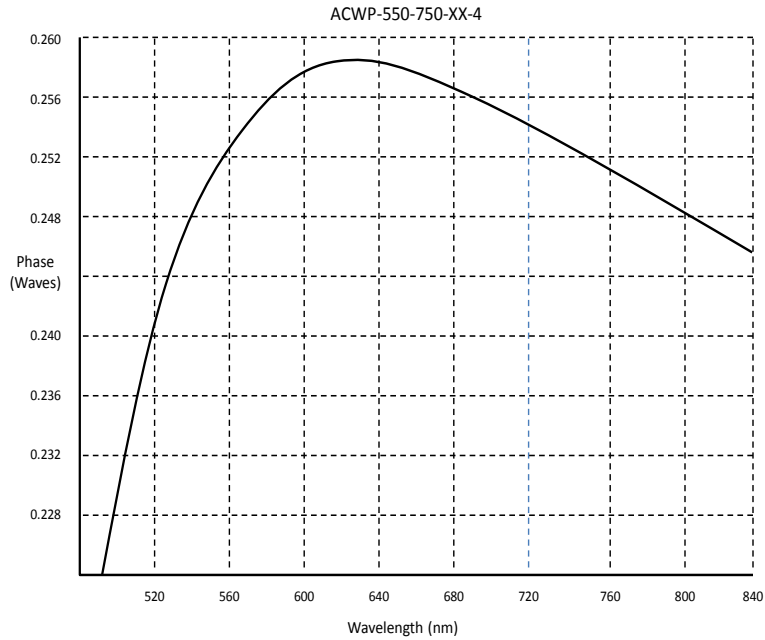
Product Code: ACWP

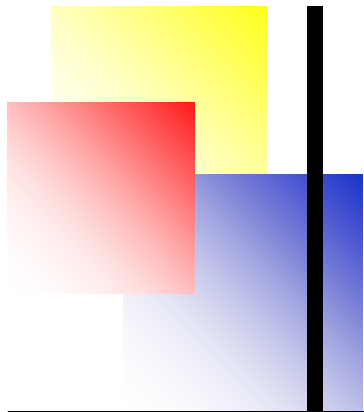




Achromatic Waveplates

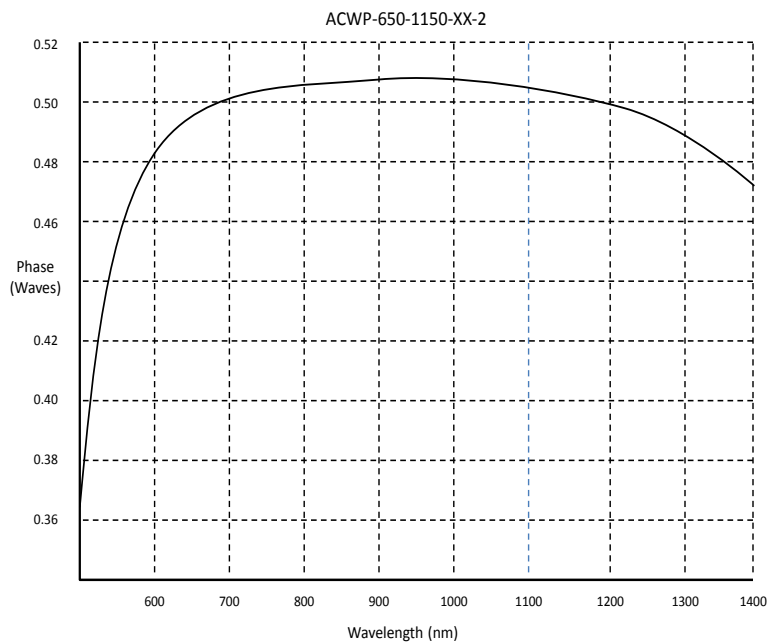
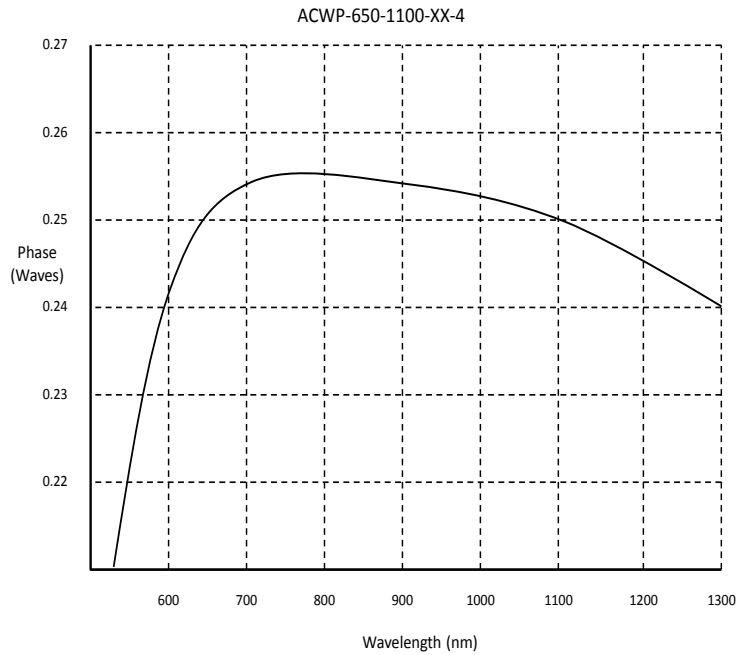
Product Code: ACWP

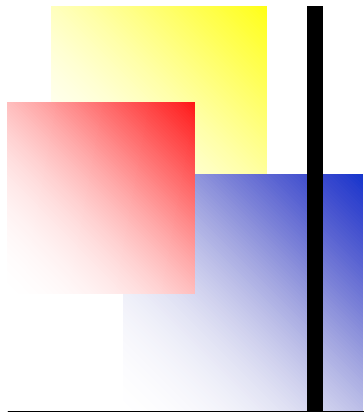




Achromatic Waveplates

Product Code: ACWP

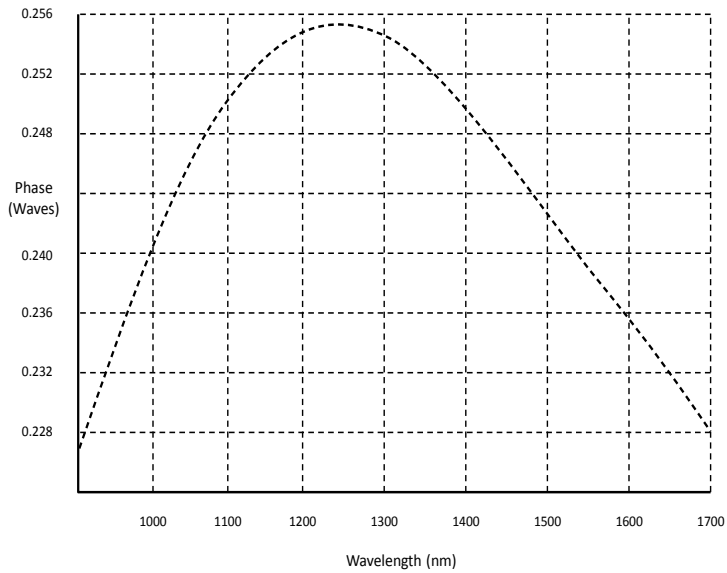




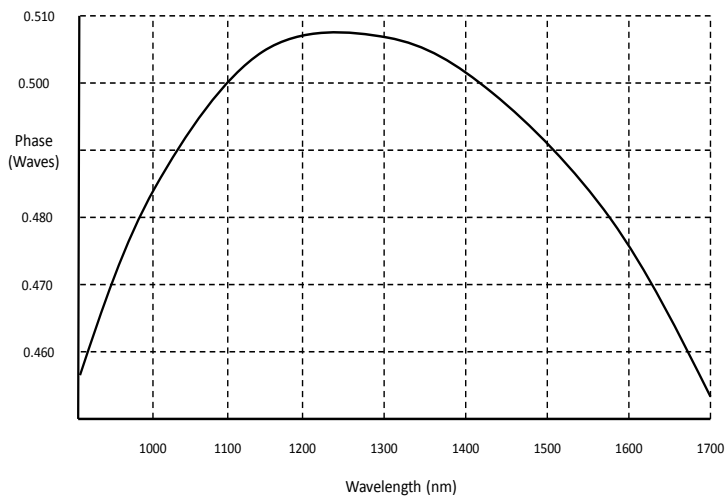
Achromatic Waveplates

Product Code: ACWP

ACWP-1050-1500-XX-4



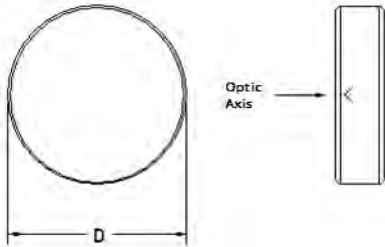
ACWP-1050-1500-XX-2



Polarization Rotators / Depolarizers

Product Code: RT / DPL

Polarization Rotators



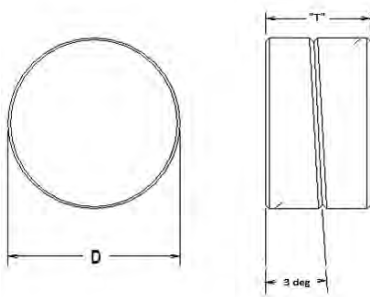
Substrate Material: Single Crystal Quartz
 Diameter Tolerance: +0.000 / -0.010" [+0.00mm / -0.25mm]
 Retardation Tolerance: $\pm 0.05^\circ$
 Transmitted Wavefront: See Table @ 633nm
 Surface Quality: 10-5 Per ANSI/OESC OP1.002-2006
 Parallelism: ≤ 2 arc seconds
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

Wavelength (nm)	Diameter (mm) D	Part Number 45°	Transmitted Wavefront	Part Number 90°	Transmitted Wavefront
355.0	25.4 or 12.7	RT-D*-355.0-45	$\lambda/10$	RT-D*-355.0-90	$\lambda/10$
532.0	25.4 or 12.7	RT-D*-532.0-45	$\lambda/10$	RT-D*-532.0-90	$\lambda/10$
1030.0	25.4 or 12.7	RT-D*-1030.0-45	$\lambda/10$	RT-D*-1030.0-90	$\lambda/6$
1047.0	25.4 or 12.7	RT-D*-1047.0-45	$\lambda/10$	RT-D*-1047.0-90	$\lambda/6$
1053.0	25.4 or 12.7	RT-D*-1053.0-45	$\lambda/10$	RT-D*-1053.0-90	$\lambda/6$
1064.0	25.4 or 12.7	RT-D*-1064.0-45	$\lambda/10$	RT-D*-1064.0-90	$\lambda/6$

*Specify desired component diameter 25.4mm (10) or 12.7mm (05). Polarization Rotators are available as a coated or uncoated elements.

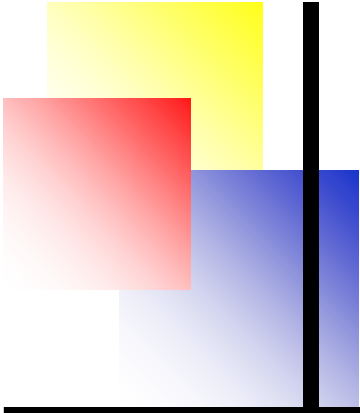
*Please contact OptiSource Technical Sales for a quote on special requirements not listed above.

UV Fused Silica / Crystal Quartz Depolarizers



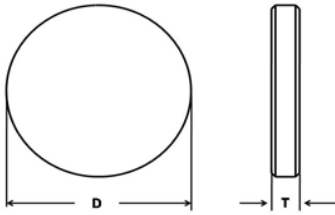
Substrate Materials: UV Grade Fused Silica / Single Crystal Quartz
 Diameter Tolerance: +0.000 / -0.010" [+0.00mm / -0.25mm]
 Retardation Tolerance: $\pm 0.05^\circ$
 Transmitted Wavefront: $\lambda/4$ @ 633nm
 Surface Quality: 10-5 Per ANSI/OESC OP1.002-2006
 Chamfer: 0.15" [0.38mm] @ 45° typical
 Clear Aperture: \geq central 85% of diameter
 Assembly Method: Optically Contacted

Part Number	Diameter (mm) "D"	BBAR Coating Range (nm)
DPL-10-450-700	25.4	450-700
DPL-10- 630-1100	25.4	630-1100
DPL-10-1200-1550	25.4	1200-1550



Thin Film Plate Polarizers

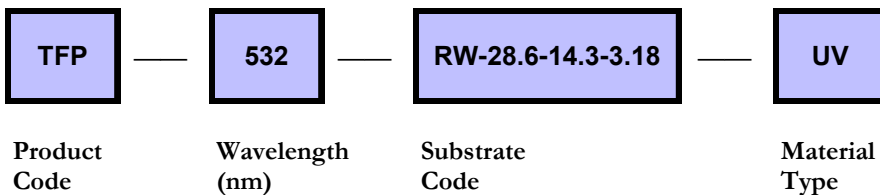
Product Code: TFP



Substrate Material: UV Fused Silica, BK-7
 Dimension Tolerance: +0.000 /-0.010" [+0.00/-0.25mm]
 Thickness Tolerance: +/-0.010" [+/-0.25mm]
 Surface Quality: 10-5
 Parallelism: ≤ 5 arc minutes
 T_p/T_s : >100 (wavelength dependent)
 Clear Aperture: ≥ central 85% of diameter
 Chamfer: 0.38mm @ 45° typical
 Damage Threshold: 1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm

- Wavelength specific.
- Angle tuning is suggested to achieve maximum transmission (typical tuning angle is 53⁰-59⁰).
- Non-standard substrates are also available, but require a quotation for price and delivery. Please contact Opti-Source, LLC Technical Sales for all of your non-standard requirements.

Order Example



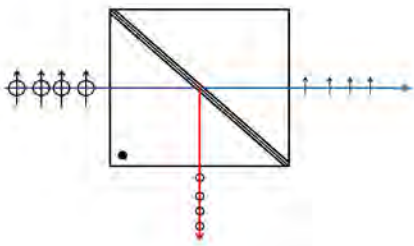
Standard Wavelengths (nm)			
248.0	266.0	308.0	354.7
527.0	532.0	694.3	1053.0
1064.0			

Customer specified substrate
(see window blanks for substrate codes)

Material Codes
BK
UV

Polarizing Beamsplitter Cubes

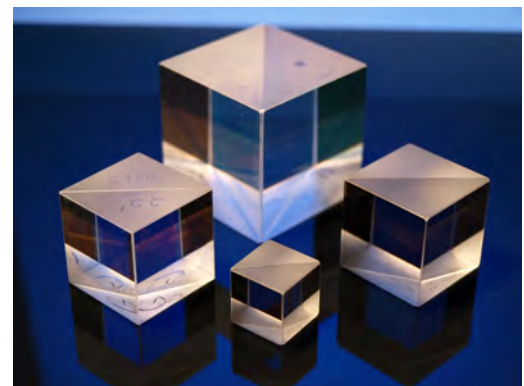
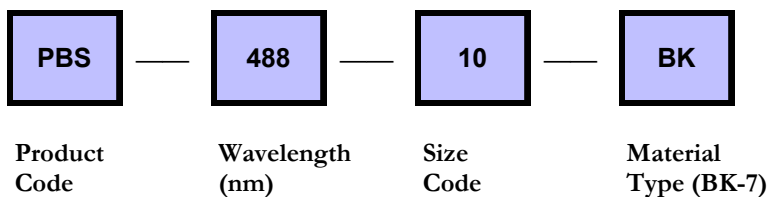
Product Code: PBS



Substrate Material: BK-7
 Dimension Tolerance: $\pm 0.010''$ [$\pm 0.25\text{mm}$]
 Transmitted Wavefront Distortion: $\lambda/4$ @ 633nm
 Surface Quality : 20-10
 Beam Deviation: < 3 arc minutes
 Extinction Ratio: $T_P/T_S > 1000:1$
 Clear Aperture: \geq central 85% of length
 AR coating: $\leq 0.25\%$ per surface
 Damage Threshold: $\geq 2\text{KW} / \text{cm}^2$ (CW); $\geq 1\text{J} / \text{cm}^2$, 10ns pulse

- Wavelength specific.
- For low power applications only (cemented).
- Dot indicates prism with coating on hypotenuse.

Order Example



Standard Wavelengths (nm)

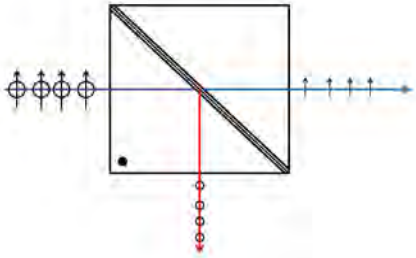
441.6	488.0	514.5	527.0
532.0	632.8	650.0	670.0
694.3	780.0	830.0	905.0
1053.0	1064.0	1310.0	1319.0
1540.0	1550.0		

Standard Size Codes

04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm
12: 30.0mm
15: 38.1mm
20: 50.8mm

High Power Polarizing Beamsplitter Cubes

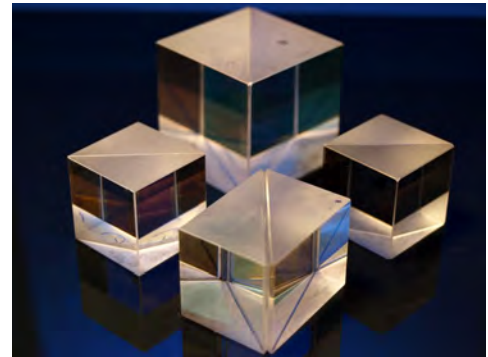
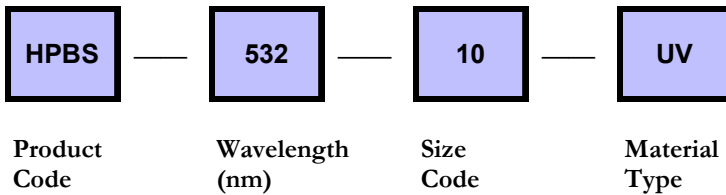
Product Code: HPBS



Substrate Material: UV Fused Silica, BK-7
 Dimension Tolerance: +/-0.010" [+/-0.25mm]
 Transmitted Wavefront Distortion: $\lambda/4$ @ 633nm
 Surface Quality : 20-10
 Beam Deviation: < 3 arc minutes
 Extinction Ratio: $T_P/T_S > 200:1$
 Clear Aperture: \geq central 85% of length
 AR coating: $\leq 0.25\%$ per surface
 Damage Threshold: $\geq 5J/cm^2$, 10ns @266nm; $\geq 10J/cm^2$, 10ns @ 1064nm

- Wavelength specific.
- For high power applications (optically contacted).
- Dot indicates prism with coating on the hypotenuse; to avoid damage the beam should enter through this prism.

Order Example



Standard Wavelengths (nm)

248.0	257.0	266.0	308.0
352.0	354.7	364.0	527.0
532.0	694.3	1047.0	1053.0
1064.0	1550.0		

Standard Size Codes

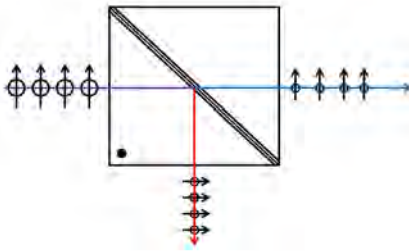
04: 10.0mm
05: 12.7mm
06: 15.0mm
08: 20.0mm
10: 25.4mm

Material Type Codes

BK
UV

Non-Polarizing Beamsplitter Cubes

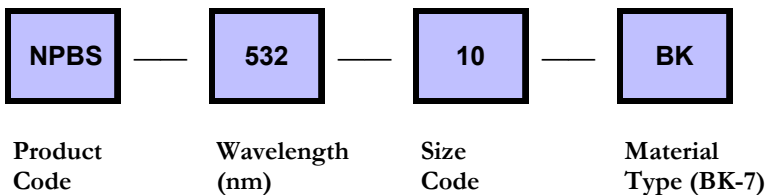
Product Code: NPBS



Substrate Material: BK-7
 Dimension Tolerance: +/-0.010" [+/-0.25mm]
 Transmitted Wavefront Distortion: $\lambda/4$ @ 633nm
 Surface Quality: 20-10
 Beam Deviation: < 3 arc minutes
 T and R: 50/50 +/-5% of T or R value
 Difference of reflectance "S" and "P": < 5%
 Clear Aperture: \geq central 85% of length
 AR coating: $\leq 0.25\%$ per surface
 Damage Threshold: $\geq 2\text{KW} / \text{cm}^2$ (CW); $\geq 1\text{J} / \text{cm}^2$, 10ns pulse

- Wavelength specific.
- For low power applications only (cemented).
- Dot indicates prism with coating on hypotenuse.

Order Example



Standard Wavelengths (nm)

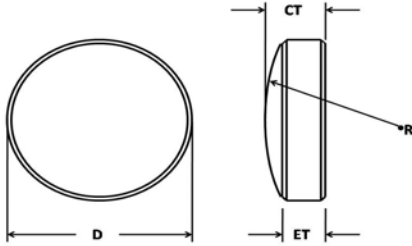
413.0	441.6	488.0	514.5
527.0	532.0	632.8	670.0
680.0	694.3	780.0	830.0
905.0	1047.0	1053.0	1064.0
1310.0	1319.0	1540.0	1550.0

Standard Size Codes

02: 6.35mm
04: 10.0mm
05: 12.7mm
08: 20.0mm
10: 25.4mm
15: 38.1mm
20: 50.8mm

Spherical UV Plano-Convex Lenses

Product Code: **PLCX-UV**



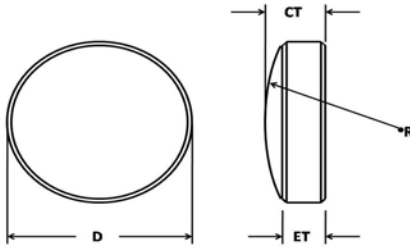
Substrate Materials: UV Fused Silica
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality: 10-5
 Surface Figure: $\lambda/10$ @ 633nm over clear aperture
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- Non-standard lenses are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.
- **Design wavelength for UV lenses is 248nm.**

Part Number	Diameter (mm)	Radius (mm)	248nm f (mm)	532nm f (mm)	1064nm f (mm)	ET (mm)
PLCX-12.7-100-UV	12.7	50.85	100	110.4	113.1	2.0
PLCX-12.7-200-UV	12.7	101.71	200	220.8	226.2	2.0
PLCX-12.7-500-UV	12.7	254.27	500	551.9	565.5	2.0
PLCX-25.4-100-UV	25.4	50.85	100	110.4	113.1	2.0
PLCX-25.4-150-UV	25.4	76.28	150	165.6	169.6	2.0
PLCX-25.4-200-UV	25.4	101.71	200	220.8	226.2	2.0
PLCX-25.4-300-UV	25.4	152.56	300	331.1	339.3	2.0
PLCX-25.4-500-UV	25.4	254.27	500	551.9	565.5	2.0
PLCX-25.4-1000-UV	25.4	508.53	1000	1103.8	1130.9	2.0
PLCX-25.4-1500-UV	25.4	762.80	1500	1655.7	1696.4	2.0
PLCX-38.1-500-UV	38.1	254.27	500	551.9	565.5	2.0
PLCX-38.1-1000-UV	38.1	508.53	1000	1103.8	1130.9	2.0
PLCX-38.1-1500-UV	38.1	762.80	1500	1655.7	1696.4	2.0
PLCX-50.8-200-UV	50.8	101.71	200	220.8	226.2	3.0
PLCX-50.8-300-UV	50.8	152.56	300	331.1	339.3	5.0
PLCX-50.8-500-UV	50.8	254.27	500	551.9	565.5	6.0
PLCX-50.8-1000-UV	50.8	508.53	1000	1103.8	1130.9	6.0
PLCX-50.8-1500-UV	50.8	762.80	1500	1655.7	1696.4	6.0

Spherical BK-7 Plano-Convex Lenses

Product Code: **PLCX-BK**



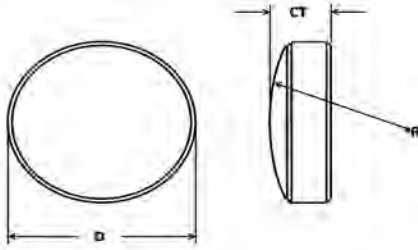
Substrate Materials: BK-7
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality: 10-5
 Surface Figure: $\lambda/10$ @ 633nm over clear aperture
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- Non-standard lenses are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.
- **Design wavelength for BK-7 lenses is 532nm.**

Part Number	Diameter (mm)	Radius (mm)	532nm f (mm)	1064nm f (mm)	ET (mm)
PLCX-12.7-100-BK	12.7	51.95	100	102.5	2.0
PLCX-12.7-200-BK	12.7	103.89	200	205.1	2.0
PLCX-12.7-500-BK	12.7	259.73	500	512.7	2.0
PLCX-25.4-100-BK	25.4	51.95	100	102.5	2.0
PLCX-25.4-150-BK	25.4	77.92	150	153.8	2.0
PLCX-25.4-200-BK	25.4	103.89	200	205.1	2.0
PLCX-25.4-300-BK	25.4	155.84	300	307.6	2.0
PLCX-25.4-500-BK	25.4	259.73	500	512.7	2.0
PLCX-25.4-1000-BK	25.4	519.47	1000	1025.3	2.0
PLCX-25.4-1500-BK	25.4	779.20	1500	1538.0	2.0
PLCX-38.1-500-BK	38.1	259.73	500	512.7	2.0
PLCX-38.1-1000-BK	38.1	519.47	1000	1025.3	2.0
PLCX-38.1-1500-BK	38.1	779.20	1500	1538.0	2.0
PLCX-50.8-200-BK	50.8	103.89	200	205.1	2.0
PLCX-50.8-300-BK	50.8	155.84	300	307.6	2.0
PLCX-50.8-500-BK	50.8	259.73	500	512.7	2.0
PLCX-50.8-1000-BK	50.8	519.47	1000	1025.3	2.0
PLCX-50.8-1500-BK	50.8	779.20	1500	1538.0	2.0

Spherical Plano-Convex Mirror Blanks

Product Code: **SMCX**



Substrate Materials: UV Fused Silica, BK-7
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Radius tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality: 10-5
 Surface Figure: $\lambda/10$ @ 633nm over clear aperture
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

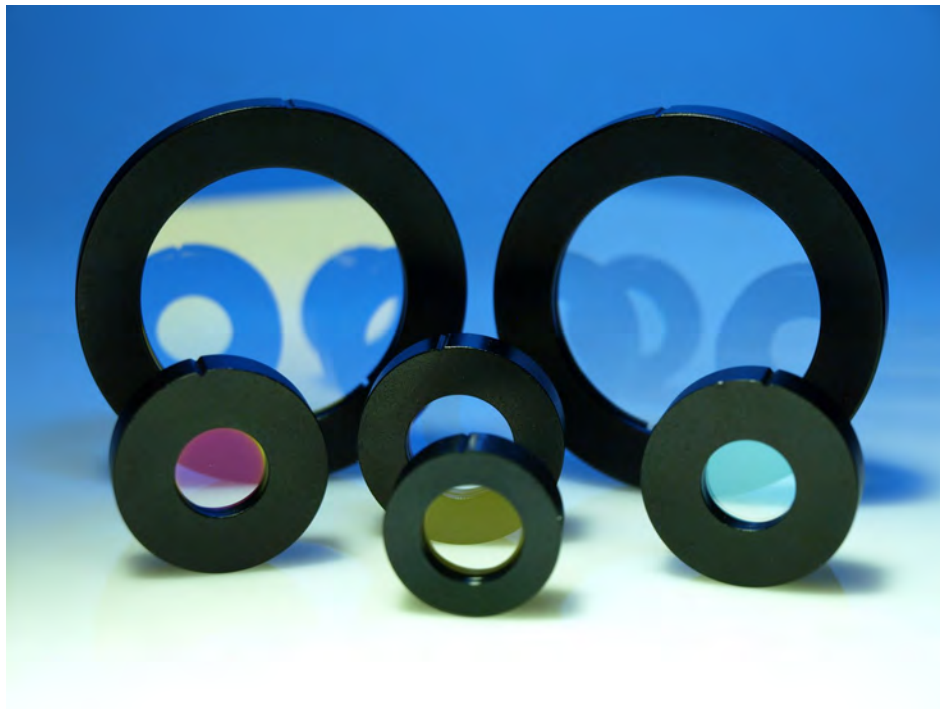
- Customer specified coatings are available.
- Mirrors are also available in 6.35mm thick (1025).
- Non-standard mirror blanks are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Part Number	Diameter (mm)	CT (mm)	Radius (mm)	Substrate Material
SMCX-1037-50-XX	25.4	9.525	50	UV, BK-7
SMCX-1037-100-XX	25.4	9.525	100	UV, BK-7
SMCX-1037-150-XX	25.4	9.525	150	UV, BK-7
SMCX-1037-200-XX	25.4	9.525	200	UV, BK-7
SMCX-1037-300-XX	25.4	9.525	300	UV, BK-7
SMCX-1037-500-XX	25.4	9.525	500	UV, BK-7
SMCX-1037-750-XX	25.4	9.525	750	UV, BK-7
SMCX-1037-1000-XX	25.4	9.525	1000	UV, BK-7
SMCX-1037-2000-XX	25.4	9.525	2000	UV, BK-7
SMCX-1037-3000-XX	25.4	9.525	3000	UV, BK-7
SMCX-1037-5000-XX	25.4	9.525	5000	UV, BK-7
SMCX-1037-7500-XX	25.4	9.525	7500	UV, BK-7
SMCX-1037-10000-XX	25.4	9.525	10000	UV, BK-7
SMCX-1037-20000-XX	25.4	9.525	20000	UV, BK-7
SMCX-2037-300-XX	50.8	9.525	300	UV, BK-7
SMCX-2037-500-XX	50.8	9.525	500	UV, BK-7
SMCX-2037-750-XX	50.8	9.525	750	UV, BK-7

Spherical Plano-Convex Mirror Blanks

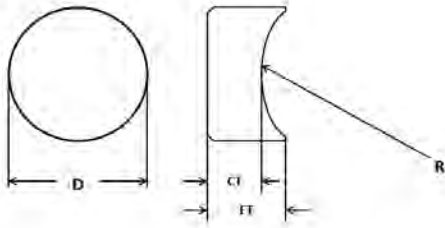
Product Code: **SMCX**

Part Number	Diameter (mm)	CT (mm)	Radius (mm)	Substrate Material
SMCX-2037-1000-XX	50.8	9.525	1000	UV, BK-7
SMCX-2037-2000-XX	50.8	9.525	2000	UV, BK-7
SMCX-2037-3000-XX	50.8	9.525	3000	UV, BK-7
SMCX-2037-5000-XX	50.8	9.525	5000	UV, BK-7
SMCX-2037-7500-XX	50.8	9.525	7500	UV, BK-7
SMCX-2037-10000-XX	50.8	9.525	10000	UV, BK-7
SMCX-2037-20000-XX	50.8	9.525	20000	UV, BK-7



Spherical UV Plano-Concave Lenses

Product Code: PLCC-UV



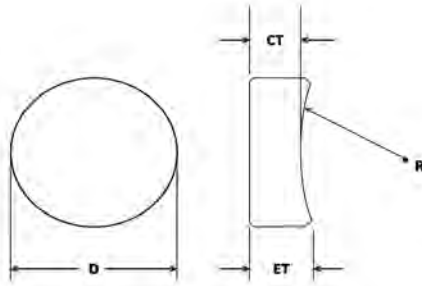
Substrate Materials: UV Fused Silica
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality : 10-5
 Surface Figure: $\lambda/10$ @ 633nm over clear aperture
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- If you are unable to find the lens you desire, please call OptiSource Technical Sales regarding a quotation for your prototype or OEM requirement.
- **Design wavelength for UV lenses is 248nm.**

Part Number	Diameter (mm)	Radius (mm)	248nm f (mm)	532nm f (mm)	1064nm f (mm)	CT (mm)
PLCC-12.7-100-UV	12.7	50.85	-100	-110.4	-113.1	2.0
PLCC-12.7-200-UV	12.7	101.71	-200	-220.8	-226.2	2.0
PLCC-12.7-500-UV	12.7	254.27	-500	-551.9	-565.5	2.0
PLCC-25.4-100-UV	25.4	50.85	-100	-110.4	-113.1	2.0
PLCC-25.4-200-UV	25.4	101.71	-200	-220.8	-226.2	2.0
PLCC-25.4-300-UV	25.4	152.56	-300	-331.1	-339.3	2.0
PLCC-25.4-500-UV	25.4	254.27	-500	-551.9	-565.5	3.0
PLCC-25.4-1000-UV	25.4	508.53	-1000	-1103.8	-1130.9	3.0
PLCC-25.4-1500-UV	25.4	762.80	-1500	-1655.7	-1696.4	4.0
PLCC-38.1-500-UV	38.1	254.27	-500	-551.9	-565.5	3.0
PLCC-38.1-1000-UV	38.1	508.53	-1000	-1103.8	-1130.9	4.0
PLCC-38.1-1500-UV	38.1	762.80	-1500	-1655.7	-1696.4	4.0
PLCC-50.8-200-UV	50.8	101.71	-200	-220.8	-226.2	3.0
PLCC-50.8-300-UV	50.8	152.56	-300	-331.1	-339.3	3.0
PLCC-50.8-500-UV	50.8	254.27	-500	-551.9	-565.5	5.0
PLCC-50.8-1000-UV	50.8	508.53	-1000	-1103.8	-1130.9	5.0
PLCC-50.8-1500-UV	50.8	762.80	-1500	-1655.7	-1696.4	5.0

Spherical BK-7 Plano-Concave Lenses

Product Code: PLCC-BK



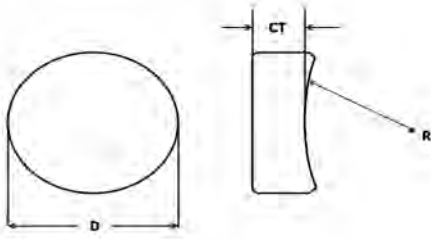
Substrate Materials: BK-7
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality: 10-5
 Surface Figure: $\lambda/10$ @ 633nm over clear aperture
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- If you are unable to find the lens you desire, please call OptiSource Technical Sales regarding a quotation for your prototype or OEM requirement.
- **Design wavelength for BK-7 lenses is 532nm.**

Part Number	Diameter (mm)	Radius (mm)	532nm f (mm)	1064nm f (mm)	CT (mm)
PLCC-12.7-100-BK	12.7	51.95	-100	-102.5	2.0
PLCC-12.7-200-BK	12.7	103.89	-200	-205.1	2.0
PLCC-12.7-500-BK	12.7	259.73	-500	-512.7	2.0
PLCC-25.4-100-BK	25.4	51.95	-100	-102.5	2.0
PLCC-25.4-200-BK	25.4	103.89	-200	-205.1	2.0
PLCC-25.4-300-BK	25.4	155.84	-300	-307.6	2.0
PLCC-25.4-500-BK	25.4	259.73	-500	-512.7	3.0
PLCC-25.4-1000-BK	25.4	519.47	-1000	-1025.3	3.0
PLCC-25.4-1500-BK	25.4	779.20	-1500	-1538.0	4.0
PLCC-38.1-500-BK	38.1	259.73	-500	-512.7	3.0
PLCC-38.1-1000-BK	38.1	519.47	-1000	-1025.3	4.0
PLCC-38.1-1500-BK	38.1	779.20	-1500	-1538.0	4.0
PLCC-50.8-200-BK	50.8	103.89	-200	-205.1	3.0
PLCC-50.8-300-BK	50.8	155.84	-300	-307.6	3.0
PLCC-50.8-500-BK	50.8	259.73	-500	-512.7	5.0
PLCC-50.8-1000-BK	50.8	519.47	-1000	-1025.3	5.0
PLCC-50.8-1500-BK	50.8	779.20	-1500	-1538.0	5.0

Spherical Plano-Concave Mirror Blanks

Product Code: SMCC



Substrate Materials: UV Fused Silica, BK-7
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Radius tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality: 10-5
 Surface Figure: $\lambda/10$ @ 633nm over clear aperture
 Chamfer: 0.38mm @ 45° typical
 Clear Aperture: \geq central 85% of diameter

- Customer specified coatings are available.
- Mirrors are also available in 6.35mm thick.
- Non-standard mirror blanks are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.

Part Number	Diameter (mm)	CT (mm)	Radius (mm)	Substrate Material
SMCC-1037-50-XX	25.4	9.525	50	UV, BK-7
SMCC-1037-75-XX	25.4	9.525	75	UV, BK-7
SMCC-1037-100-XX	25.4	9.525	100	UV, BK-7
SMCC-1037-150-XX	25.4	9.525	150	UV, BK-7
SMCC-1037-200-XX	25.4	9.525	200	UV, BK-7
SMCC-1037-300-XX	25.4	9.525	300	UV, BK-7
SMCC-1037-500-XX	25.4	9.525	500	UV, BK-7
SMCC-1037-750-XX	25.4	9.525	750	UV, BK-7
SMCC-1037-1000-XX	25.4	9.525	1000	UV, BK-7
SMCC-1037-1500-XX	25.4	9.525	1500	UV, BK-7
SMCC-1037-2000-XX	25.4	9.525	2000	UV, BK-7
SMCC-1037-3000-XX	25.4	9.525	3000	UV, BK-7
SMCC-1037-5000-XX	25.4	9.525	5000	UV, BK-7
SMCC-1037-7500-XX	25.4	9.525	7500	UV, BK-7
SMCC-1037-10000-XX	25.4	9.525	10000	UV, BK-7
SMCC-1037-20000-XX	25.4	9.525	20000	UV, BK-7
SMCC-2037-100-XX	50.8	9.525	100	UV, BK-7

Spherical Plano-Concave Mirror Blanks

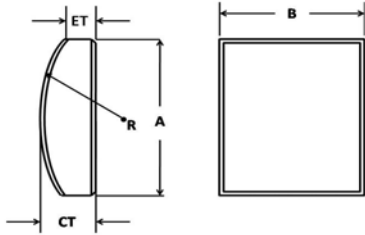
Product Code: SMCC

Part Number	Diameter (mm)	CT (mm)	Radius (mm)	Substrate Material
SMCC-2037-200-XX	50.8	9.525	200	UV, BK-7
SMCC-2037-300-XX	50.8	9.525	300	UV, BK-7
SMCC-2037-500-XX	50.8	9.525	500	UV, BK-7
SMCC-2037-750-XX	50.8	9.525	750	UV, BK-7
SMCC-2037-1000-XX	50.8	9.525	1000	UV, BK-7
SMCC-2037-1500-XX	50.8	9.525	1500	UV, BK-7
SMCC-2037-2000-XX	50.8	9.525	2000	UV, BK-7
SMCC-2037-3000-XX	50.8	9.525	3000	UV, BK-7
SMCC-2037-5000-XX	50.8	9.525	5000	UV, BK-7
SMCC-2037-10000-XX	50.8	9.525	10000	UV, BK-7



Cylindrical BK-7 Plano-Convex Lenses

Product Code: CLCX-BK



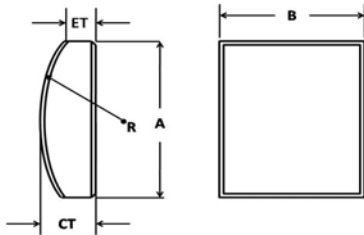
Substrate Materials: BK-7
 Diameter Tolerance: $+0.000 / -0.005"$ [$+0.000 / -0.127\text{mm}$]
 Thickness tolerance: $\pm 0.010"$ [$\pm 0.25\text{mm}$]
 Focal length tolerance: $\pm 0.5\%$
 Concentricity: < 3 arc minutes
 Surface Quality : 20-10
 Surface Figure: $\lambda/4$ for X direction
 $\lambda/2$ for Y direction
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- Non-standard lenses are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.
- **Focal length is nominal at 1064nm.**

Part Number	X (mm)	Y (mm)	R (mm)	Nominal f (mm)	ET (mm)	CT (mm)
CLCX-1005-12.7-BK	25.4	12.7	6.57	12.7	3.0	7.9
CLCX-1005-19.1-BK	25.4	12.7	9.82	19.1	3.0	5.3
CLCX-1010-50.8-BK	25.4	25.4	26.3	50.8	3.0	6.4
CLCX-1010-100-BK	25.4	25.4	51.7	100	3.0	4.6
CLCX-1010-500-BK	25.4	25.4	258.5	500	3.0	3.3
CLCX-1010-1000-BK	25.4	25.4	517.0	1000	3.0	3.2
CLCX-2010-25.4-BK	50.8	25.4	13.1	25.4	3.0	12.8
CLCX-2010-38.1-BK	50.8	25.4	19.7	38.1	3.0	7.6
CLCX-2010-50.8-BK	50.8	25.4	26.3	50.8	3.0	6.3
CLCX-2010-76.2-BK	50.8	25.4	39.4	76.2	3.0	5.1
CLCX-2010-100-BK	50.8	25.4	51.7	100	3.0	4.6
CLCX-2020-100-BK	50.8	50.8	51.7	100	3.0	9.7
CLCX-2020-200-BK	50.8	50.8	103.4	200	3.0	6.2
CLCX-2020-500-BK	50.8	50.8	258.5	500	3.0	4.3
CLCX-2020-1000-BK	50.8	50.8	517.0	1000	3.0	3.7

Cylindrical UV Fused Silica Plano-Convex Lenses

Product Code: CLCX-UV



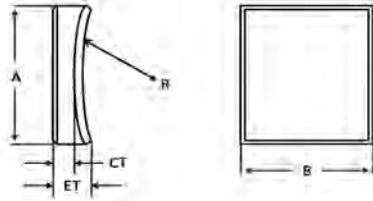
Substrate Materials: UV Fused Silica
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality : 20-10
 Surface Figure: $\lambda/4$ for X direction
 $\lambda/2$ for Y direction
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- Non-standard lenses are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.
- **Focal length is nominal at 1064nm.**

Part Number	X (mm)	Y (mm)	R (mm)	Nominal f (mm)	ET (mm)	CT (mm)
CLCX-1010-50.8-UV	25.4	25.4	23.4	50.8	3.0	6.4
CLCX-1010-100-UV	25.4	25.4	46.0	100	3.0	4.7
CLCX-1010-500-UV	25.4	25.4	230.0	500	3.0	3.3
CLCX-1010-1000-UV	25.4	25.4	460.0	1000	3.0	3.2
CLCX-2010-38.1-UV	50.8	25.4	17.5	38.1	3.0	7.5
CLCX-2010-50.8-UV	50.8	25.4	23.4	50.8	3.0	6.4
CLCX-2010-76.2-UV	50.8	25.4	35.1	76.2	3.0	5.2
CLCX-2010-100-UV	50.8	25.4	46.0	100	3.0	4.1
CLCX-2020-100-UV	50.8	50.8	46.0	100	3.0	9.8
CLCX-2020-200-UV	50.8	50.8	92.0	200	3.0	6.6
CLCX-2020-500-UV	50.8	50.8	230.0	500	3.0	3.7
CLCX-2020-1000-UV	50.8	50.8	460.0	1000	3.0	3.2

Cylindrical BK-7 Plano-Concave Lenses

Product Code: CLCC-BK



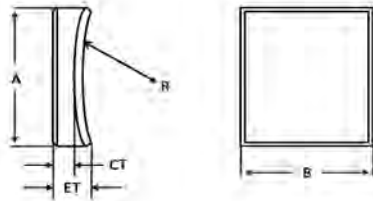
Substrate Materials: BK-7
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality : 20-10
 Surface Figure: $\lambda/4$ for X direction
 $\lambda/2$ for Y direction
 Clear Aperture: \geq central 85% of diameter

- Customer specified antireflection coatings are available.
- Non-standard lenses are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.
- **Focal length is nominal at 1064nm.**

Part Number	X (mm)	Y (mm)	R (mm)	Nominal f (mm)	CT (mm)	ET (mm)
CLCC-1005-12.7-BK	25.4	12.7	6.57	-12.7	6.0	9.6
CLCC-1005-25.4-BK	25.4	12.7	13.1	-25.4	6.0	7.4
CLCC-1010-50.8-BK	25.4	25.4	26.3	-50.8	6.0	9.4
CLCC-1010-100-BK	25.4	25.4	51.7	-100	6.0	7.6
CLCC-1010-500-BK	25.4	25.4	258.5	-500	6.0	6.3
CLCC-1010-1000-BK	25.4	25.4	517.0	-1000	6.0	6.2
CLCC-2010-25.4-BK	50.8	25.4	13.1	-25.4	6.0	7.7
CLCC-2010-38.1-BK	50.8	25.4	19.7	-38.1	6.0	10.7
CLCC-2010-50.8-BK	50.8	25.4	26.3	-50.8	6.0	9.4
CLCC-2010-76.2-BK	50.8	25.4	39.4	-76.2	6.0	8.2
CLCC-2010-100-BK	50.8	25.4	51.7	-100	6.0	7.6
CLCC-2020-100-BK	50.8	50.8	51.7	-100	6.0	12.7
CLCC-2020-200-BK	50.8	50.8	103.4	-200	6.0	9.2
CLCC-2020-500-BK	50.8	50.8	258.5	-500	6.0	7.3
CLCC-2020-1000-BK	50.8	50.8	517.0	-1000	6.0	6.6

Cylindrical UV Fused Silica Plano-Concave Lenses

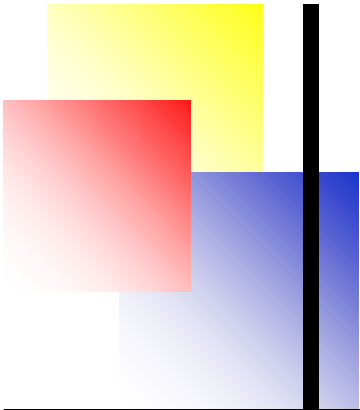
Product Code: CLCC-UV



Substrate Materials: UV Fused Silica
 Diameter Tolerance: +0.000 /-0.005" [+0.000/-0.127mm]
 Thickness tolerance: +/-0.010" [+/-0.25mm]
 Focal length tolerance: +/-0.5%
 Concentricity: < 3 arc minutes
 Surface Quality : 20-10
 Surface Figure: $\lambda/4$ for X direction
 $\lambda/2$ for Y direction
 Clear Aperture: \geq central 85% of diameter

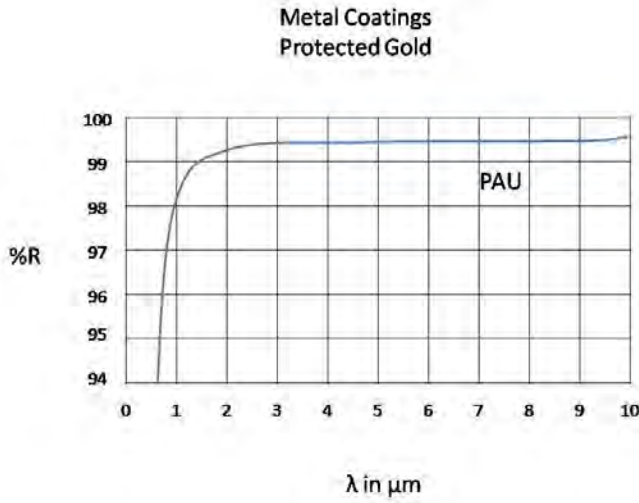
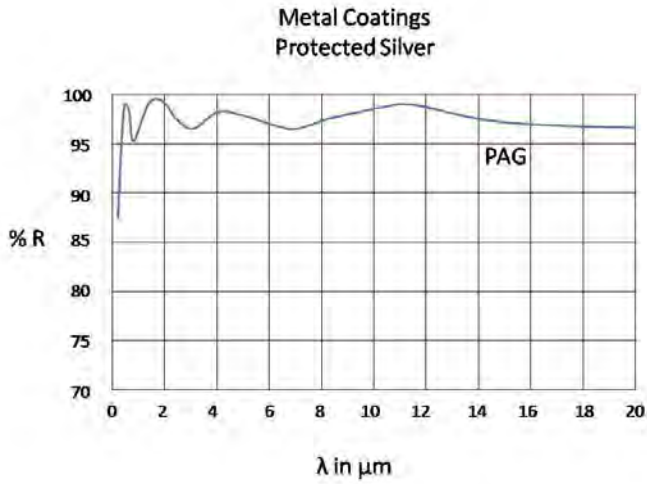
- Customer specified antireflection coatings are available.
- Non-standard lenses are also available, but require a quotation for price and delivery. Please contact OptiSource, LLC Technical Sales for all of your non-standard requirements.
- **Focal length is nominal at 1064nm.**

Part Number	X (mm)	Y (mm)	R (mm)	Nominal f (mm)	CT (mm)	ET (mm)
CLCC-1010-50.8-UV	25.4	25.4	23.4	-50.8	3.0	4.1
CLCC-1010-100-UV	25.4	25.4	46.0	-100	3.0	4.7
CLCC-1010-500-UV	25.4	25.4	230.0	-500	3.0	3.3
CLCC-1010-1000-UV	25.4	25.4	460.0	-1000	3.0	3.2
CLCC-2010-38.1-UV	50.8	25.4	17.5	-38.1	3.0	7.8
CLCC-2010-50.8-UV	50.8	25.4	23.4	-50.8	3.0	6.5
CLCC-2010-76.2-UV	50.8	25.4	35.1	-76.2	3.0	5.3
CLCC-2010-100-UV	50.8	25.4	46.0	-100	3.0	4.7
CLCC-2020-100-UV	50.8	50.8	46.0	-100	4.5	11.6
CLCC-2020-200-UV	50.8	50.8	92.0	-200	4.5	7.9
CLCC-2020-500-UV	50.8	50.8	230.0	-500	4.5	5.9
CLCC-2020-1000-UV	50.8	50.8	460.0	-1000	4.5	4.6

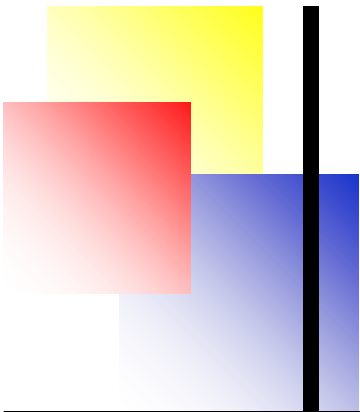


Metallic Coatings

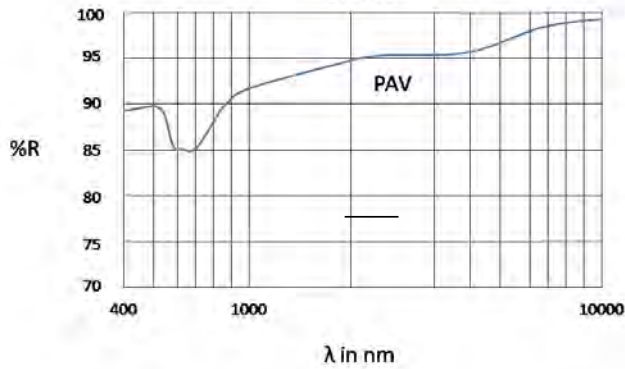
λ (nm)	Nominal Reflectivity %		
	Al	Ag	Au
200	91.1		
250	92.0		
300	92.3	17.6	37.7
350	92.5	80.5	36.2
400	92.4	95.6	38.7
500	91.8	97.9	47.7
600	91.1	98.6	91.9
650	90.5	98.8	95.5
700	89.7	98.9	97.0
800	86.7	99.2	98.0
850	86.7	99.2	98.2
900	89.1	99.3	98.4
1000	94.0	99.4	98.6
2000	97.8	99.4	99.1
3000	98.0	99.4	99.3
5000	98.4	99.5	99.4
10000	98.7	99.5	99.4
20000	99.0	99.6	99.4



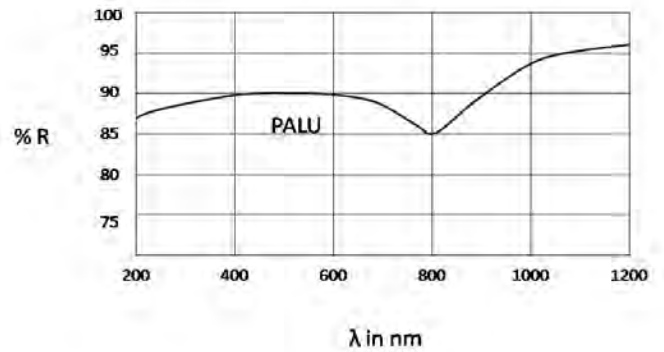
Metallic Coatings



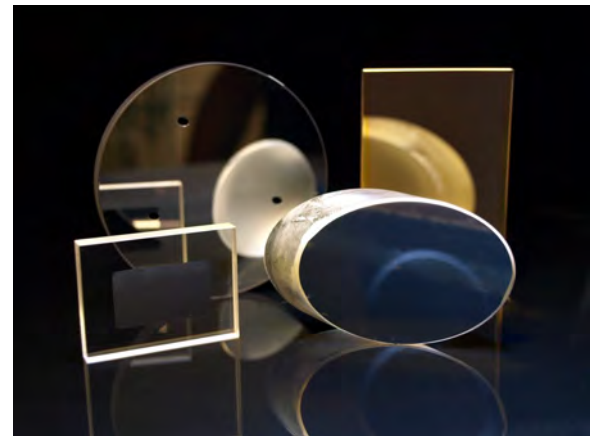
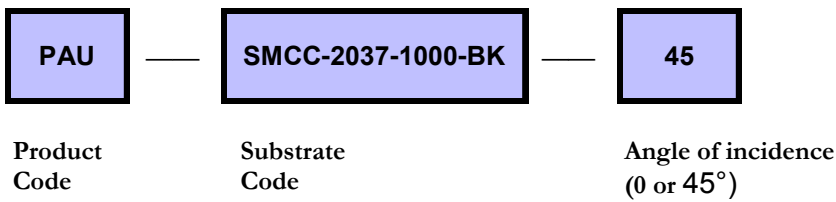
Metal Mirrors
Protected Aluminum Mirrors
Vis - IR



Metal Coatings
Protected Aluminum - UV



Order Example



Product codes

PAU: Protected Gold
PAG: Protected Silver
PAV: Protected Aluminum Vis
PALU: Protected Aluminum UV

Customer specified substrate
(see blanks for substrate codes)

High Damage Threshold Antireflection Coatings

Double "V" Antireflection Coatings

R<0.25-0.50% typical @ 0° or 45°

Wavelengths: 532/1064nm; 527/1054nm; 355/1064nm;
355/532nm; 400/800nm; 633/1064nm and 633/532nm

Other combinations are available on request

Damage Threshold

**1MW/cm² (CW); 10J/cm², 10ns pulse
typical @ 1064nm**

Broadband Antireflection Coatings

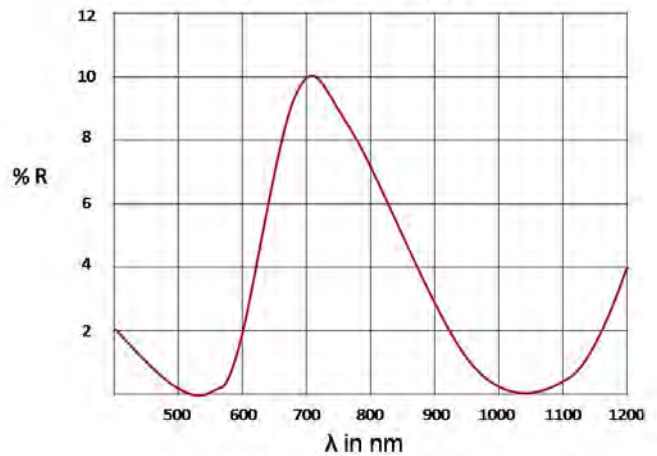
R<0.50% average @ 0° or 45°

Wavelengths: 193-248nm; 248-355nm; 355-532nm; 425-
675nm; 500-800nm; 670-1064nm; 860-1320nm and 1053-
1620nm

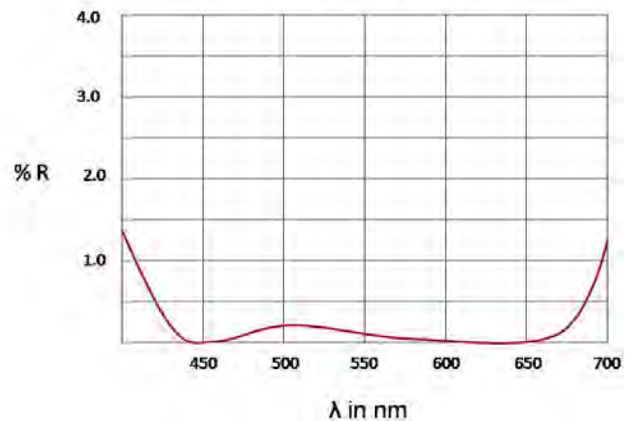
Other bandwidths are available on request



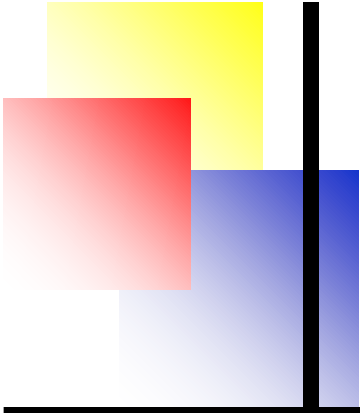
DBL "V" AR 532nm & 1064nm, 0°
R<0.25% - 0.50% typical @ 0° or 45°



BBAR 425nm – 675nm, 0°
R<0.50% avg typical @ 0° or 45°



High Damage Threshold Antireflection Coatings

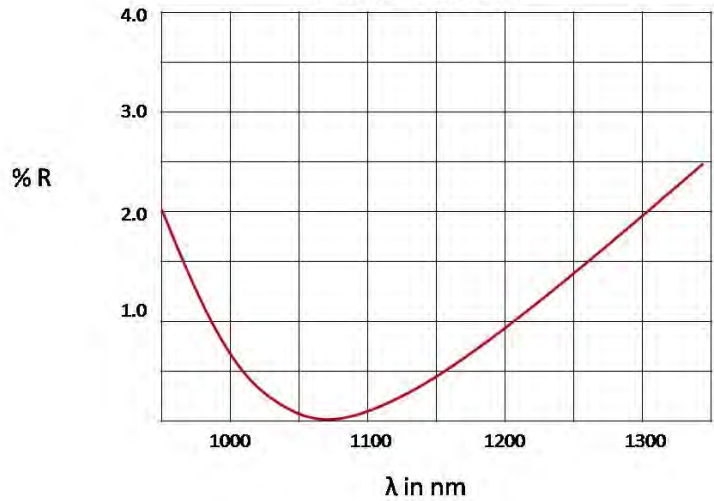


Antireflection "V" Coatings

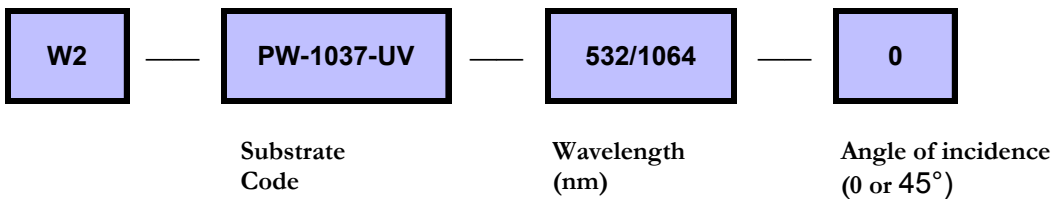
$R < 0.25\%$ typical @ 0° or 45°

Wavelengths available from 248nm to 2.0 microns

"V" AR @ 1064nm, 0°
 $R < 0.25\%$ typical @ 0° or 45°
 $R < 0.10\%$ on quotation basis



Order Example



W1: one side coated
W2: two sides coated

Customer specified substrate
(see blanks for substrate codes)

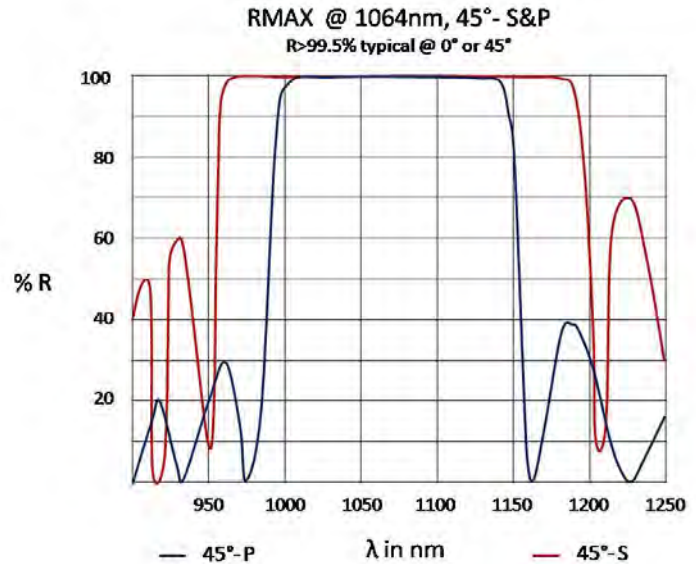
High Damage Threshold Laser Mirrors

Maximum Reflector Mirror Coatings

R>99.5% typical @ 0° or 45°

Wavelengths available from 248nm to 2.0 microns

Other wavelengths are available on request



Eximer Laser Mirrors

ARF (193nm)

KrF (248nm)

XeCl (308nm)

XeF (351-352nm)

N₂ Laser Mirrors (337nm)

He-Cd Laser Mirrors (441.6nm, 325nm)

Ar-Ion Laser Mirrors (488nm, 514.5nm)

Copper Vapor Laser Mirrors (511nm, 578nm)

He-Ne Laser Mirrors (632.8nm)

Ruby Laser Mirrors (694.3nm, 347nm)

Alexandrite Laser Mirrors (720-780nm)

Nd:YAG Laser Mirrors

(1064nm, 532nm, 355nm, 266nm)

Nd:YLF Laser Mirrors

(1047nm, 524nm, 349nm, 262nm, 1053nm, 527nm, 351nm, 1063nm)

Iodine (1315nm)

Er:Glass Laser Mirrors (1540nm)

Diode Laser Mirrors

(670nm, 680nm, 780nm, 803nm, 830nm, 905nm, 980nm)

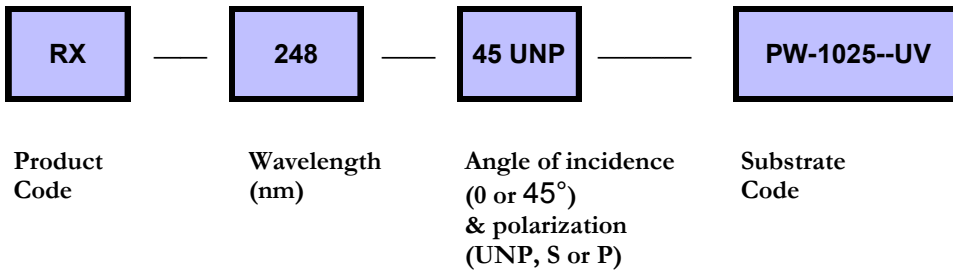
Semiconductor Laser Mirrors (1319nm, 1550nm)

Damage Threshold

1MW/cm² (CW); 10J/cm², 10ns pulse
typical @ 1064nm

High Damage Threshold Laser Mirrors

Order Example

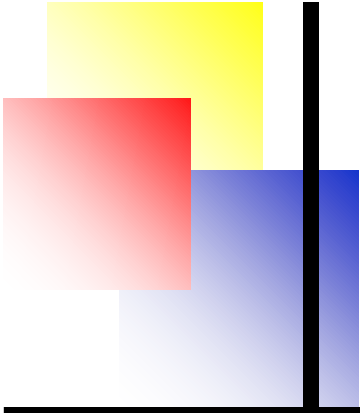


Product code

Customer specified substrate
(see blanks for substrate codes)

RX: Maximum Reflector





High Damage Threshold Short and Long Wave Pass Coatings

Short or Long Pass Wavelength Coatings

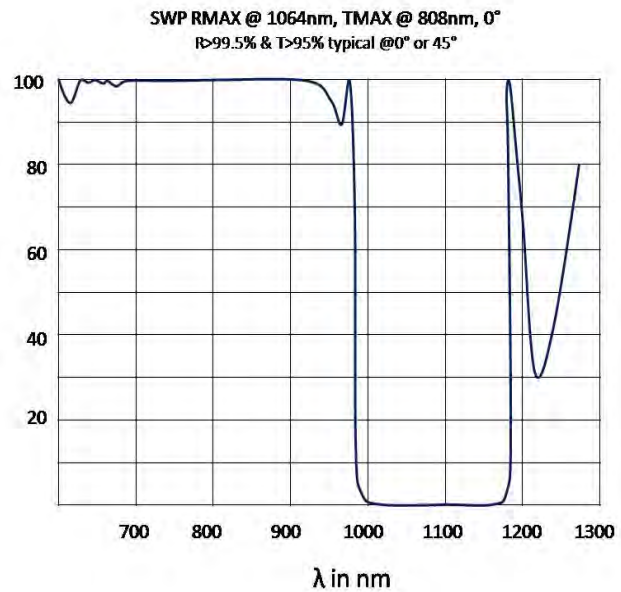
R>99.5%; T>95% typical @ 0° or 45°

Wavelengths available from 248nm to 2.0 microns

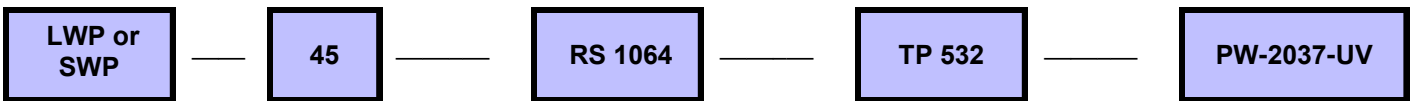
Other wavelengths are available on request

Damage Threshold

1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm



Order Example

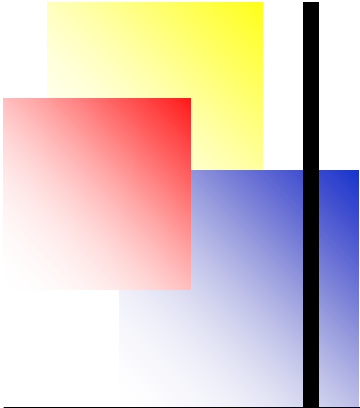


Product Code	Angle of incidence (0 or 45°)	Reflected wavelength (nm) w/polarization	Transmitted wavelength (nm) w/polarization	Substrate Code
LWP or SWP	45	RS 1064	TP 532	PW-2037-UV

Customer specified substrate
(see blanks for substrate codes)



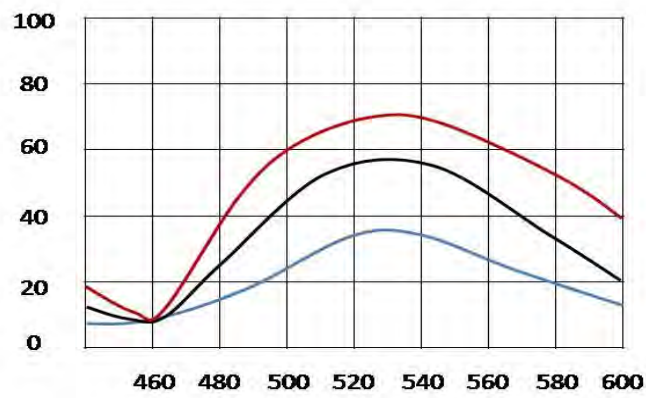
High Energy Beamsplitters



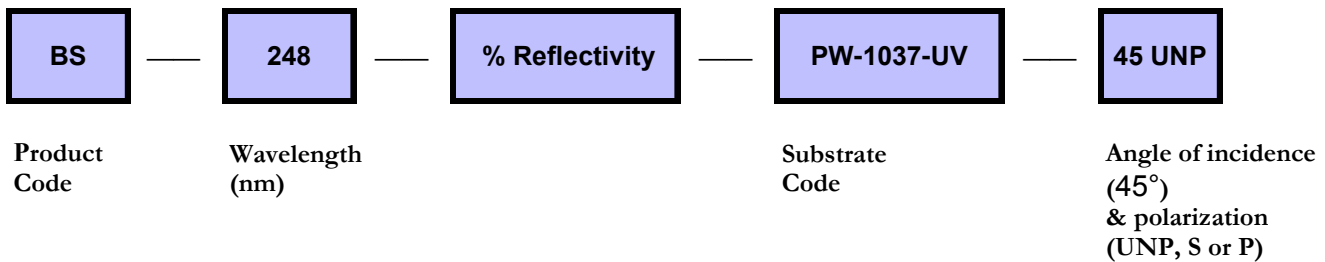
Reflectivity Tolerances %

5+/-1	10+/-2
15 +/-2	20+/-3
25+/-3	30+/-3
35+/-3	40+/-3
45+/-4	50+/-4
55+/-4	60+/-4
65+/-4	70+/-4
75+/-4	80+/-4
85+/-3	90+/-3
95+/-2.5	97+/-2
98+/-1	99+/-0.5

45° Beamsplitter



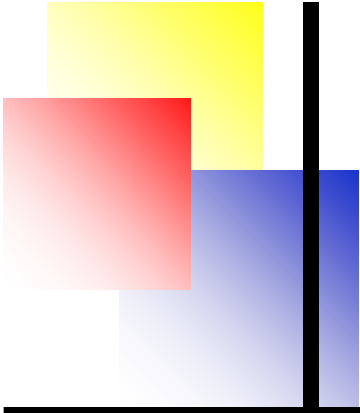
Order Example



Customer specified substrate
(see blanks for substrate codes)

Damage Threshold

1MW/cm² (CW); 10J/cm², 10ns pulse typical @ 1064nm



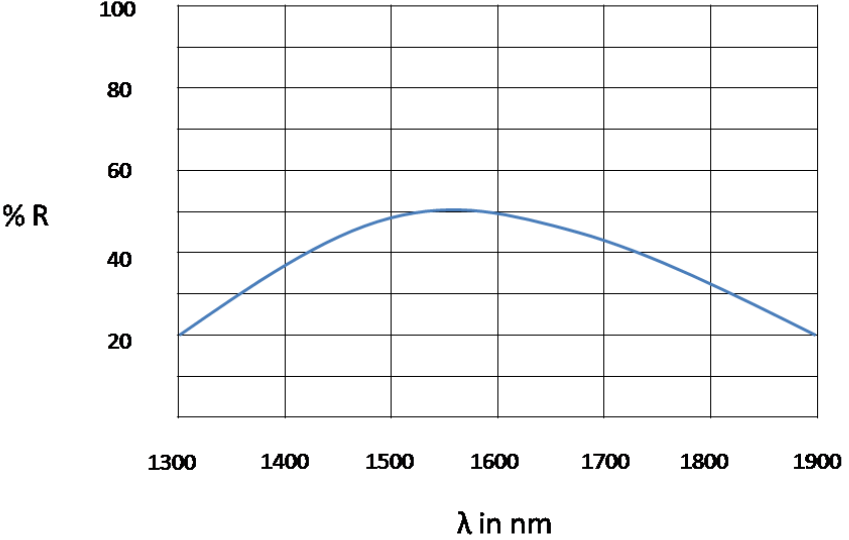
High Energy Partial Reflectors For Normal Incidence

Reflectivity Tolerances %

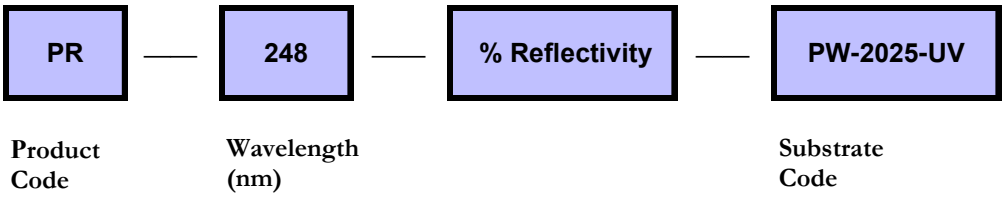
5+/-3	10+/-3
15 +/-4	20+/-4
25+/-5	30+/-5
35+/-5	40+/-5
45+/-5	50+/-5
55+/-4	60+/-4
65+/-4	70+/-4
75+/-4	80+/-4
85+/-3	90+/-3
95+/-2.5	97+/-2
98+/-1	99+/-0.5

Partial Reflector – 0°

R=50% @ 1550nm, AOI = 0° - Shown below



Order Example



Customer specified substrate
(see blanks for substrate codes)

Damage Threshold

1MW/cm² (CW); 10J/cm², 10ns pulse
typical @ 1064nm

Index of Refraction Ultraviolet Materials

Wavelength (nm)	MgF ₂		CaF ₂	Sapphire		Crystal Quartz		Fused Silica
	n _e	n _o	n	n _e	n _o	n _e	n _o	
193	1.44127	1.42767	1.50153	1.91743	1.92879	1.67455	1.66091	1.56077
213	1.42933	1.41606	1.48544	1.87839	1.88903	1.64452	1.63224	1.53539
222	1.42522	1.41208	1.47996	1.86504	1.87540	1.63427	1.62238	1.52669
226	1.42358	1.41049	1.47779	1.85991	1.87017	1.63033	1.61859	1.52335
244	1.41735	1.40447	1.46957	1.84075	1.85059	1.61562	1.60439	1.51086
248	1.41618	1.40334	1.46803	1.83719	1.84696	1.61289	1.60175	1.50855
257	1.41377	1.40102	1.46488	1.82972	1.83932	1.60714	1.59620	1.50368
266	1.41164	1.39896	1.46209	1.82358	1.83304	1.60242	1.59164	1.49968
280	1.40877	1.39620	1.45836	1.81509	1.82437	1.59589	1.58533	1.49416
308	1.40429	1.39188	1.45255	1.80198	1.81096	1.58577	1.57556	1.48564
325	1.40216	1.38983	1.44981	1.79582	1.80467	1.58102	1.57097	1.48164
337	1.40086	1.38859	1.44814	1.79206	1.80082	1.57812	1.56817	1.47919
351	1.39952	1.38730	1.44642	1.78825	1.79693	1.57518	1.56533	1.47672
355	1.39917	1.38696	1.44597	1.78732	1.79598	1.57446	1.56463	1.47612

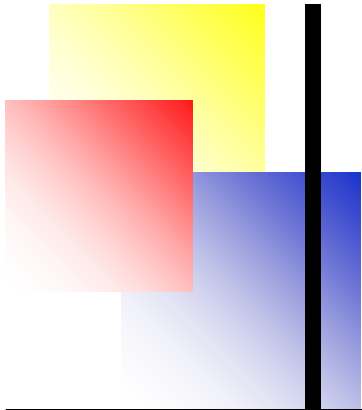


Index of Refraction Visible Materials

Wavelength (nm)	Schott	Schott	Schott	Sapphire		Crystal Quartz		Fused Silica
	BK-7	F2	SF10	n_e	n_o	n_e	n_o	
400	1.53085	1.65215	1.77826	1.77807	1.78652	1.56730	1.55772	1.47012
442	1.52611	1.64058	1.75970	1.77206	1.78038	1.56266	1.55324	1.46622
458	1.52461	1.63716	1.75434	1.77015	1.77843	1.56119	1.55181	1.46498
488	1.52224	1.63178	1.74602	1.76711	1.77533	1.55885	1.54955	1.46301
515	1.52049	1.62784	1.73999	1.76486	1.77304	1.55711	1.54787	1.46156
532	1.51947	1.62569	1.73673	1.76355	1.77170	1.55610	1.54690	1.46071
590	1.51670	1.61983	1.72794	1.75996	1.76804	1.55333	1.54421	1.45838
633	1.51509	1.61654	1.72307	1.75787	1.76590	1.55171	1.54264	1.45702
670	1.51391	1.61421	1.71965	1.75632	1.76433	1.55051	1.54148	1.45601
694	1.51322	1.61290	1.71773	1.75542	1.76341	1.54981	1.54080	1.45542
755	1.51172	1.61009	1.71367	1.75346	1.76141	1.54827	1.53932	1.45414
780	1.51118	1.60911	1.71227	1.75274	1.76068	1.54771	1.53878	1.45367
800	1.51078	1.60839	1.71124	1.75220	1.76013	1.54729	1.53837	1.45332
820	1.51039	1.60771	1.71028	1.75168	1.75961	1.54688	1.53798	1.45298
860	1.50966	1.60648	1.70854	1.75072	1.75863	1.54612	1.53724	1.45234
980	1.50779	1.60349	1.70441	1.74819	1.75607	1.54409	1.53531	1.45067
1064	1.50663	1.60183	1.70217	1.74663	1.75449	1.54282	1.53410	1.44963
1320	1.50346	1.59785	1.69706	1.74227	1.75009	1.53922	1.53068	1.44669
1550	1.50065	1.59487	1.69348	1.73838	1.74618	1.53596	1.52761	1.44402
2010	1.49435	1.58905	1.68693	1.72973	1.73748	1.52863	1.52073	1.43794



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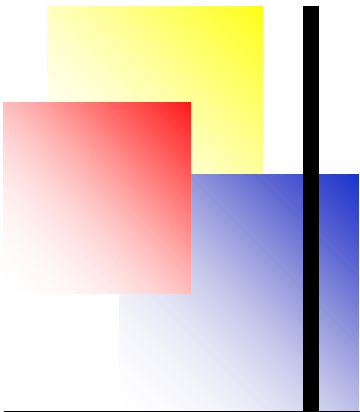


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