Waveplate

Principle of Waveplate

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

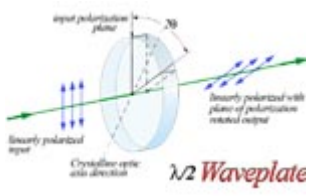
Half Waveplate

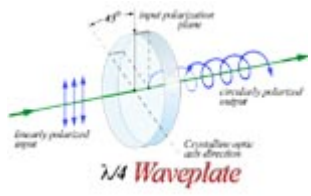
The thickness of a half waveplate is such that the phase difference is 1/2-wavelength (true-zero order) or some multiple of 1/2-wavelength (multiple order). A linearly polarized beam incident on a half waveplate emerges as a linearly polarized beam but rotated such that its angle to the optical axis is twice that of the incident beam. Therefore, half-waveplates can be used as continuously adjustable polarization rotators. Half-waveplates are used in rotating the plane of polarization, electro-optic modulation and as a variable ratio beamsplitter when used in conjunction with a polarization cube.

Quarter Waveplate

The thickness of the quarter waveplate is such that the phase difference is 1/4 wavelength (ture-zero order) or some multiple of 1/4 wavelength (multiple order).

If the angle θ (between the electric field vector of the incident linearly polarized beam and the retarder principal plane) of the quarter-waveplate is 45, the emergent beam is circularly polarized. When a quarter waveplate is double passed, i.e. by mirror reflection, it acts as a half waveplate and rotates the plane of polarization to a certain angle. Quarter waveplates are used in creating circular polarization from linear or linear polarization from circular, ellipsometry, optical pumping, suppressing unwanted reflection and optical isolation.



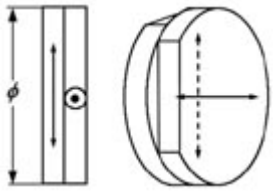


Order Information: Part No.+Retardance+Wavlength

Sample: WPL101+λ/2+1064nm

Cemented Achroatic Waveplate

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



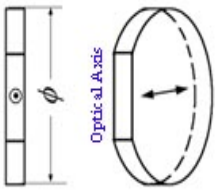
Diameter	ϕ 10.0	ϕ 12.7	ϕ 15.0
Part No.	WPA101	WPA102	WPA103
Unit Price:	US$300	US$310	US$320

Specifications:

Material:	Optical grade Crystal Quartz and MgF2
Dimension Tolerance:	+0.0,-0.2mm
Wavefront Distortion:	<λ/4@633nm
Retardation Tolerance:	<λ/100
Surface Quality:	20/10 Scratch and Dig
AR Coating:	R<1% at center wavelength
Standard wavelength:	VIS: 465nm-610nm NIR: 700nm-1000nm IR: 1200nm-1650nm

Low-Order Waveplate

1. Thickness: 0.2-0.5 mm
2. High Damage Threshold
3. Low Cost



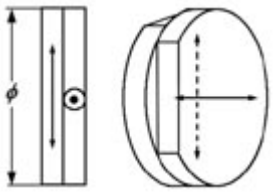
Diameter	ϕ 10.0	ϕ 12.7	ϕ 15.0	ϕ 20.0	ϕ 25.4
Part No.	WPL101	WPL102	WPL103	WPL104	WPL105
Unit Price:	US$65	US$75	US$85	US$115	US$135

Specifications:

Material:	Optical grade Crystal Quartz
Dimension Tolerance:	+0.0,-0.2mm
Wavefront Distortion:	<λ/8@633nm
Retardation Tolerance:	<λ/300
Surface Quality:	20/10 Scratch and Dig
AR Coating:	R<0.2% at center wavelength
Standard wavelength:	266nm, 355nm, 532nm, 632.8nm, 800nm, 850nm, 980nm, 1064nm, 1310nm, 1550nm

Optically Contacted Zero-Order Waveplate

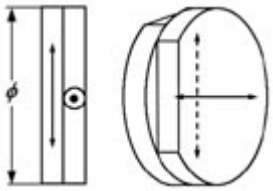
1. Optically Contacted
2. Thickness 1.5~2mm
3. Double Retardation Plates
4. Broad Spectral Bandwidth
5. Wide Temp. bandwidth



Diameter	ϕ 10.0	ϕ 12.7	ϕ 15.0	ϕ 20.0	ϕ 25.4
Part No.	WPZ101	WPZ102	WPZ103	WPZ104	WPZ105
Unit Price:	US$115	US$125	US$135	US$145	US$165

Cemented Zero-Order Waveplate

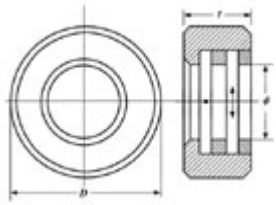
Cemented by Epoxy
Better Temperature Bandwidth
Wide Wavelength Bandwidth
AR Coated, R<0.2%



Diameter	ϕ 10.0	ϕ 12.7	ϕ 15.0	ϕ 20.0	ϕ 25.4
Part No.	WPZ201	WPZ202	WPZ203	WPZ204	WPZ205
Unit Price:	US$95	US$105	US$115	US$125	US$145

Air Spaced Zero-Order Waveplate

Double Retardation Plates
AR Coated,R<0.2% and Mounted
High Damage Threshold
Better Temperature Bandwidth
Wide Wavelength Bandwidth



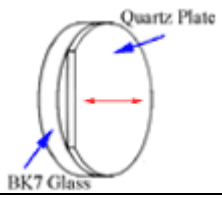
Diameter	ϕ 10.0	ϕ 12.7	ϕ 15.0	ϕ 20.0	ϕ 25.4
Part No.	WPZ301	WPZ302	WPZ303	WPZ304	WPZ305
Unit Price:	US$125	US$135	US$145	US$165	US$195

Specifications:

Material:	Optical grade Crystal Quartz
Dimension Tolerance:	+0.0,-0.2mm
Wavefront Distortion:	<λ/8@633nm
Retardation Tolerance:	<λ/300
Surface Quality:	20/10 Scratch and Dig
AR Coating:	R<0.2% at center wavelength
Standard wavelength:	266nm, 355nm, 532nm, 632.8nm, 800nm, 850nm, 980nm, 1064nm, 1310nm, 1550nm

Cemented Ture Zero-Order Waveplate

Cemented by Epoxy
Wide Angle Acceptance
Better Temperature Bandwidth
Wide Wavelength Bandwidth



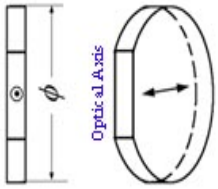
Diameter	ϕ 10.0	ϕ 12.7	ϕ 15.0	ϕ 20.0	ϕ 25.4
Part No.	WPZ401	WPZ402	WPZ403	WPZ404	WPZ405
Unit Price:	US$135	US$145	US$155	US$165	US$195

Specifications:

Material:	Optical grade Crystal Quartz
Dimension Tolerance:	+0.0,-0.2mm
Wavefront Distortion:	<λ/8@633nm
Retardation Tolerance:	<λ/300
Surface Quality:	20/10 Scratch and Dig
AR Coating:	R<0.2% at center wavelength
Standard wavelength:	532nm, 632.8nm, 800nm, 850nm, 980nm, 1064nm, 1310nm, 1550nm

Single Plate Ture Zero-order Waveplate

1.Broad Spectral Bandwidth
2.Wide Temperature .Bandwidth
3.Wide Angle Bandwidth
4.High Damage Threshold



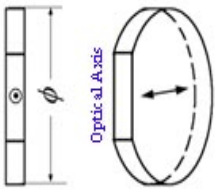
Diameter	2x2	ϕ 10	ϕ 12.7.0	ϕ 15.0	ϕ 20
Part No.	WPT101	WPT102	WPT103	WPT104	WPT105
Unit Price	US$100	US$160	US$180	US$200	US$280

Specifications:

Material:	Optical grade Crystal Quartz
Dimension Tolerance:	+0.0,-0.2mm
Wavefront Distortion:	<λ/8@633nm
Retardation Tolerance:	<λ/300
Surface Quality:	20/10 Scratch and Dig
AR Coating:	R<0.2% at center wavelength
Standard wavelength:	1310nm, 1550nm

Dual-wavelength Waveplate

1. Single retardation plate
2. DBAR Coating
3. Unmounted



Diameter	ϕ 12.7	ϕ 15.0	ϕ 20.0	ϕ 25.4
Part No.	WPD102	WPD103	WPD104	WPD105
Unit Price	US$150	US$175	US$195	US$220

Specifications:

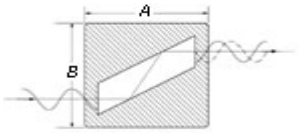
Material:	Optical grade Crystal Quartz
Dimension Tolerance:	+0.0,-0.2mm
Wavefront Distortion:	<λ/8@633nm

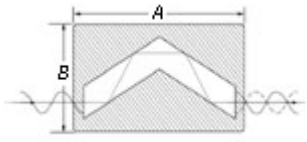
Retardation Tolerance:	<λ/300
Surface Quality:	20/10 Scratch and Dig
AR Coating:	R<0.2% at center wavelength λ @1064nm + λ /2@532nm
Standard wavelength:	λ /2@1064nm + λ @532nm

Note: Other sizes, waveplate and coatings are available upon request.

Fresnel Rhomb Retarder

Material: BK7 Glass, UVFS
Flatness: λ/10 @ 632.8 nm
400-2000 nm for BK7
λ range: 200-2000nm for UVFS
Bevel: 0.25x45° mm





Part No.	A (mm)	B (mm)	H (mm)	Retardation	Material	Unit Price
FRP101	35	40	37	λ/4	BK7	US$200
FRP102	64	40	37	λ/2	BK7	US$370
FRP103	35	40	37	λ/4	F.S.	US$300
FRP104	64	40	37	λ/2	F.S.	US$570