

WAVEPLATE OVERVIEW

Waveplate	Part #	Illustration	Wavelength Bandwidth ($\lambda/4@532\text{nm}$)	($\lambda/100$ Bandwidth) $\lambda/2 @532\text{nm}$	Plates	Acceptance Angle	Typical Length	Damage Threshold	Page	
Multi-order Waveplate(Quartz) (Can be Replaced by Low-order)	WPMxxxx			0.29nm ($T=0.9686\text{mm}$)	Single	Low	1~2mm	1GW/cm ²		
Low-order Waveplate(Quartz)	WPLxxxx			0.92nm ($T=0.3036\text{mm}$)	Single	Medium	0.2~0.5mm	1GW/cm ²	9	
Zero-order Waveplate (Quartz)	Optically Contracted	WPOxxxx			19.22nm ($\Delta T=0.0145\text{mm}$)	Double (Optical Contacted)	Low	~1mm	~200 MW/cm ²	10
	Air-spaced	WPAxxxx			19.22nm ($\Delta T=0.0145\text{mm}$)	Double (Air Spaced)	Low	~1mm	~500 MW/cm ²	11
	Cemented	WPCxxxx			19.22nm ($\Delta T=0.0145\text{mm}$)	Double Cemented (Epoxy)	Low	~1mm	~10MW/cm ²	11
Achromatic Waveplate (Quartz)	WPBxxxx			200 nm	Double (Optical Contacted or Air Spaced)	Low	~2mm	~10MW/cm ²	12	

WAVEPLATE OVERVIEW

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True Zero-order Waveplate	High Power Waveplate (Quartz, BK7, Fused Silica)	WPH xxxx			19.22nm (T=0.0145 mm)	Double (Optical Bonding)	High	$>1\text{GW}/\text{cm}^2$	13	
	Cemented (Quartz, BK7, Fused Silica)	WPF xxxx			19.22nm (T=0.0145 mm)	Double (Cemented by Epoxy)	High	$\sim 1\text{mm}$	$\sim 10\text{MW}/\text{cm}^2$	14
	Single Plate (Quartz)	WPS xxxx			19.22nm (T=0.0145 mm)	Single	High	$<0.2\text{mm}$	$>1\text{GW}/\text{cm}^2$	14
	Single Plate (Quartz) with BK7 Holder	WPD xxxx			19.22nm (T=0.0145 mm)	Single (BK7 Ring as Holder)	High	$<0.2\text{mm}$	$>1\text{GW}/\text{cm}^2$	15
Double Wavelength Waveplate (Quartz)	WPDxxxx			Very Small	Single	Low	0.2~2mm	1GW/cm2	15	
Fresnel Rhomb Retarder (Fused Silica, BK7, CaF ₂)	FRRxxxx			Broadband	Single or Double (Optical Contact or Cemented)	Medium		500 MW/cm2	16	
Polarization Rotators (Quartz)	WPRxxxx			20 nm	Single	High	3.33mm (90° @ 532nm)	1GW/cm2	17	

Waveplate

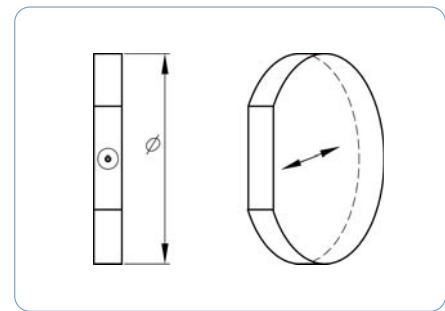
LOW ORDER WAVEPLATE

The low order waveplate which can be replaced by multi-order waveplate is designed to give a retardance of several full waves, plus the desired fraction. This results in a single, physically robust component with desired performance. However, even small variation in wavelength or temperature will result in significant changes in the desired fractional retardance.

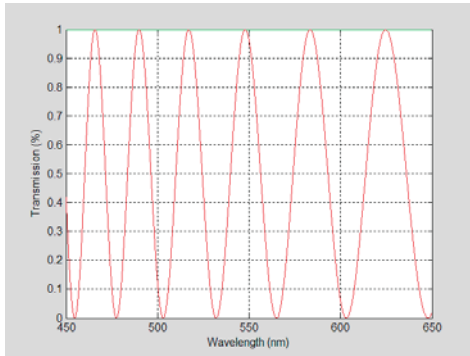


Specifications

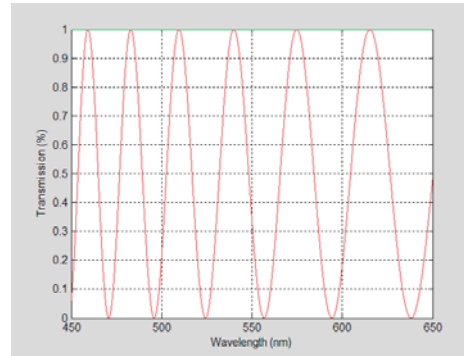
Material	Quartz
Dimension Tolerance	+0.0, -0.1
Wavefront Distortion	$\lambda / 8 @ 633\text{nm}$
Retardation Tolerance	$\lambda / 300$
Parallelism	<1 arc second
Surface Quality	20/10 Scratch/Dig
Clear Aperture	Central 90%
AR Coating	<0.2% @wavelength
Holder	Refer to <<Holders for waveplates>>



Standard Wavelength:266nm,355nm,532nm,632.8nm,780nm,808nm,980nm,1064nm,1310nm,1550nm



$\lambda / 2 @ 532\text{nm}$



$\lambda / 4 @ 532\text{nm}$

Dayoptics Standard Products (Without Holder)

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WPL210Q	WPL210H	10.0	\$45
WPL212Q	WPL212H	12.7	\$52
WPL215Q	WPL215H	15.0	\$65
WPL220Q	WPL220H	20.0	\$75
WPL225Q	WPL225H	25.4	\$85
WPL230Q	WPL230H	30.0	\$95

ZERO ORDER WAVEPLATE

The zero order waveplate is designed to give a retardance of zero full waves, plus the desired fraction. Zero order waveplate shows better performance than multiple order waveplates. It has broad bandwidth and a lower sensitivity to temperature and wavelength changes. It should be considered for more critical applications.

Specifications

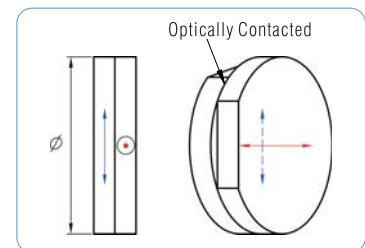
Material	Quartz
Dimension Tolerance	+0.0, -0.1
Wavefront Distortion	$< \lambda / 8 @ 633\text{nm}$
Retardation Tolerance	$\lambda / 500$
Parallelism	< 1 arc second
Surface Quality	20/10 Scratch/Dig
Clear Aperture	Central 90%
AR Coating	$< 0.2\% @ \text{Wavelength}$
Holder	Refer to Holder for Waveplate

Standard Wavelength: 266nm,355nm,532nm,632.8nm,780nm,808nm,980nm,1064nm,1310nm,1550nm

Note: wavelengths within the range of 240–2300nm are also available upon request.

Zero Order Waveplates Optically Contacted

- Optically Contacted
- AR Coated, $R < 0.2\%$
- High Damage Threshold
- Better Temperature Bandwidth
- Wide Wavelength Bandwidth



Standard Wavelength: 266nm,355nm,532nm,632.8nm,780nm,808nm,850nm,980nm,1064nm,1310nm,1480nm,1550nm

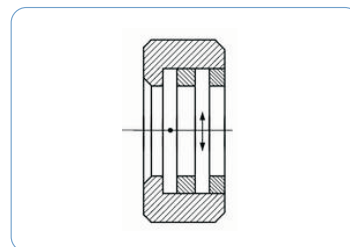
Dayoptics Standard Products (Without Holder)

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WP0210Q	WP0210H	10.0	\$75
WP0212Q	WP0212H	12.7	\$82
WP0215Q	WP0215H	15.0	\$88
WP0220Q	WP0220H	20.0	\$92
WP0225Q	WP0225H	25.4	\$108
WP0230Q	WP0230H	30.0	\$128

ZERO ORDER WAVEPLATE

Zero Order Waveplates Air-spaced

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



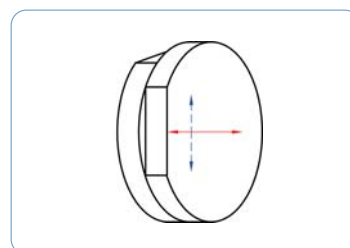
Dayoptics Standard Products

Quarter Waveplates P/N#	Half Waveplates P/N#	Waveplate Aperture(mm)	Mount Diameter(mm)	Mount Thickness (mm)	Unit Price
WPA210Q	WPA210H	10.0	25.4	6.0	\$85.0
WPA212Q	WPA212H	12.7	25.4	6.0	\$92.0
WPA215Q	WPA215H	15.0	25.4	6.0	\$98.0
WPA220Q	WPA220H	20.0	30.0	6.0	\$108.0
WPA225Q	WPA225H	25.4	30.0	6.0	\$118.0
WPA230Q	WPA230H	30.0	38.1	6.0	\$138.0

Zero Order Waveplates Cemented by Epoxy

This type of zero order waveplate is constructed of two multiple order waveplate with their axes crossed. Thus, the effect of the first plate is canceled by the second, except for the residual difference between them.

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



Dayoptics Standard Products (Without Holder)

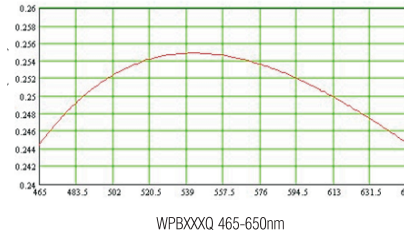
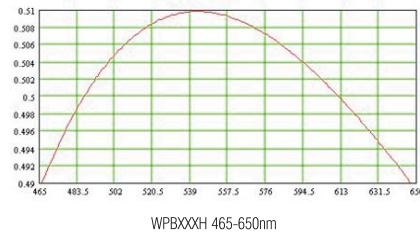
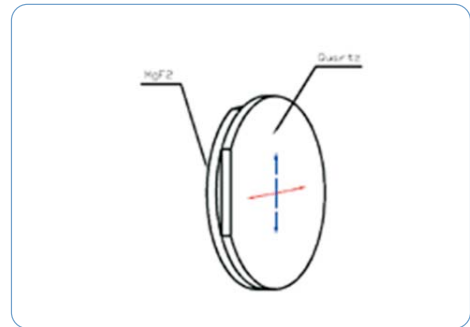
Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WPC210Q	WPC210H	10.0	\$72
WPC212Q	WPC212H	12.7	\$80
WPC215Q	WPC215H	15.0	\$86
WPC220Q	WPC220H	20.0	\$90
WPC225Q	WPC225H	25.4	\$106
WPC230Q	WPC230H	30.0	\$126

ACHROMATIC WAVEPLATES

Dayoptics has special designed achromatic waveplates by using two pieces of plate. It 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. From the curve, you can see that the bandwidth of such achromatic waveplate is very wide, while the achromatic waveplates remain a nearly constant retardance over a range of wavelength.

Specifications

Material	Quartz and MgF ₂
Wavefront Distortion	$\lambda / 8 @ 633\text{nm}$
Dimension Tolerance	+0.0,-0.1
Retardation Tolerance	$\lambda / 100$
Parallelism	<1 arc second
Surface Quality	40/20 Scratch/Dig
Clear Aperture	Central 90%
AR Coating	Ravg>1.5% at Central Wavelength
Standard Wavelength	VIS 465-650nm,NIR 650-1100nm,IR 1000-1750nm



Achromatic Waveplate Optical Cemented

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WPB210Q	WPB210H	10.0	\$128
WPB212Q	WPB212H	12.7	\$138
WPB215Q	WPB215H	15.0	\$158
WPB220Q	WPB220H	20.0	\$188
WPB225Q	WPB225H	25.4	\$218
WPB230Q	WPB230H	30.0	\$258

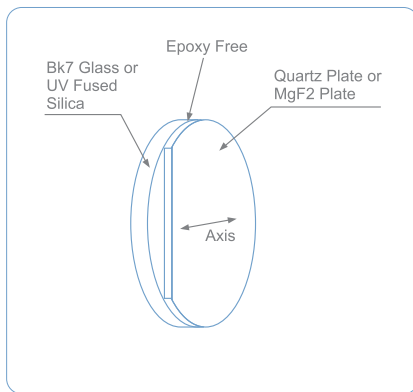
Achromatic Waveplate Air-Spaced (Mounted)

Quarter Waveplates P/N#	Half Waveplates P/N#	Waveplate Aperture(mm)	Mount Diameter(mm)	Unit Price
WPB510Q	WPB510H	10.0	12.7	\$138
WPB512Q	WPB512H	12.7	25.4	\$148
WPB515Q	WPB515H	15.0	25.4	\$168
WPB520Q	WPB520H	20.0	25.4	\$198
WPB525Q	WPB525H	25.4	30.0	\$228
WPB530Q	WPB530H	30.0	38.1	\$268

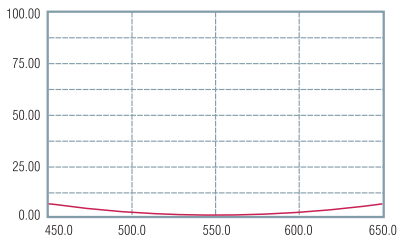
HIGH POWER WAVEPLATE

Features

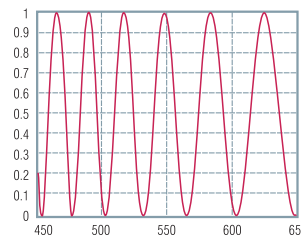
- True Zero Order Waveplate
- Epoxy Free
- High Power: $> 10\text{J}/\text{cm}^2$ @ 1064nm, 20ns, 20Hz
- Used Wavelength: 400~3000nm
- Good for UV Application
- Easy Handling



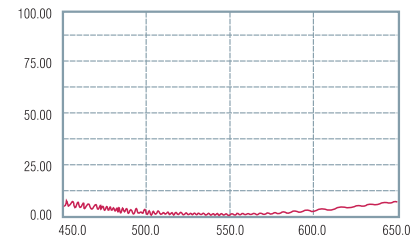
Waveplate Comparison	High Power Waveplate	Low-order Waveplate	Zero-order Waveplate (Cemented/Optical Contacted)
For Short	WPH	WPL	WPC / WPO
$\lambda / 100$ Spectra Bandwidth @ 532nm	9.16nm	0.51nm	9.16nm
$\lambda / 100$ Temperature Bandwidth ΔT	230.56K	12.13K	230.56K
Acceptance Angle	11.37°	2.63°	11.37°
Damage Threshold @ 1064nm, 10ns, 20Hz	$> 10\text{J}/\text{cm}^2$	$> 10\text{J}/\text{cm}^2$	$\sim 0.1\text{J}/\text{cm}^2$ (WPC) $\sim 2\text{J}/\text{cm}^2$ (WPO)
Extinction Ratio	High	High	Low



High Power Waveplate



Low-order Waveplate



Zero-order Waveplate

Quarter Waveplate Part No.	Half waveplate Part No.	Diameter	Unit Price
WPH210Q	WPH210H	10.0	\$86
WPH212Q	WPH212H	12.7	\$95
WPH215Q	WPH215H	15.0	\$102
WPH220Q	WPH220H	20.0	\$115
WPH225Q	WPH225H	25.4	\$128
WPH230Q	WPH230H	30.0	\$158

Advantages of High Power Waveplate

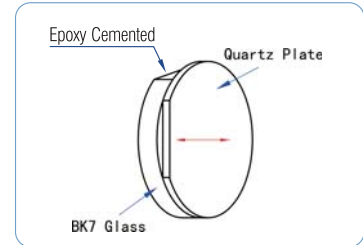
- Compare with WPL, WPH has wider spectra & temperature bandwidth and wider angular field.
- Based on our unique optical bonding technology, WPH has higher damage threshold and better extinction ratio which compared with WPO or WPC.
- The thickness of WPH is more suitable for handling compare with single plate true zero order waveplate, which is easy to be damaged.



TRUE ZERO ORDER WAVEPLATE

This type of waveplate is constructed of a true zero order waveplate and a BK7 substrate. As the waveplate is very thin and easy to be damaged, the BK7 plates function is to strengthen the waveplate.

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



Standard Wavelength:

$\lambda/4$: 532nm, 632.8nm, 780nm, 808nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm

$\lambda/2$: 532nm, 632.8nm, 780nm, 808nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm

Dayoptics Standard Products

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WPF210Q	WPF210H	10.0	\$82
WPF212Q	WPF212H	12.7	\$90
WPF215Q	WPF215H	15.0	\$98
WPF220Q	WPF220H	20.0	\$110
WPF225Q	WPF225H	25.4	\$120
WPF230Q	WPF230H	30.0	\$150

True Zero Order Waveplate Single Waveplate

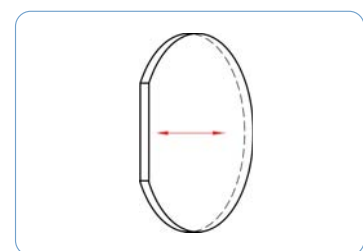
This type of waveplate is made of a very thin quartz waveplate which function as true zero order. In some cases, the thickness required for single true zero order waveplates is too thin, they have to be provided as first order waveplate.

Standard Wavelength:

$\lambda/4$: 1310nm, 1480nm, 1550nm

$\lambda/2$: 980nm, 1064nm, 1310nm, 1480nm, 1550nm

Minimal Thickness: 0.038mm



Dayoptics Standard Products

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WPS210Q	WPS210H	10.0	\$68
WPS212Q	WPS212H	12.7	\$72
WPS215Q	WPS215H	15.0	\$75
WPS220Q	WPS220H	20.0	\$85
WPS225Q	WPS225H	25.4	\$95
WPS230Q	WPS230H	30.0	\$105



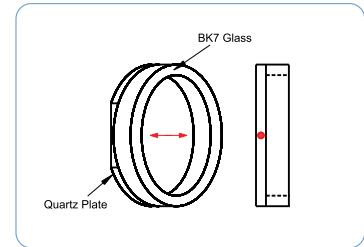
TRUE ZERO ORDER WAVEPLATE

WPQ is our new product, true zero order waveplate single waveplate on annual glass frames, the ray only through the quartz, epoxy free. It can meet high damage threshold and better parallelism. The frames can be designed by different requirement .

Standard Wavelength:

$\lambda /4$: 1310nm, 1480nm, 1550nm

$\lambda /2$: 980nm, 1064nm, 1310nm, 1480nm, 1550nm



Dayoptics Standard Products

Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)	Unit Price
WPQ210Q	WPQ210H	10.0	\$108
WPQ212Q	WPQ212H	12.7	\$118
WPQ215Q	WPQ215H	15.0	\$148
WPQ220Q	WPQ220H	20.0	\$168
WPQ225Q	WPQ225H	25.4	\$188
WPQ230Q	WPQ230H	30.0	\$208

Double Wavelength Waveplate

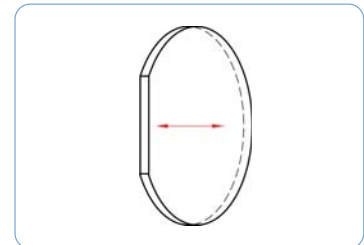
Double Wavelength Waveplate is a special kind of multi-order waveplate, it can meet the required retardation at two wavelength at the same time. It widely used to improve the conversion efficiency in solid double frequency laser device.

- Better Parallelism
- Wide Angle Acceptance
- Better Temperature Bandwidth
- Wide Wavelength Bandwidth
- AR Coated, $R < 0.2\%$

Standard Wavelength:

$\lambda @1064\text{nm} + \lambda /2@532\text{nm}$, $\lambda /2@1064\text{nm} + \lambda @532\text{nm}$

$\lambda @532\text{nm} + \lambda /2@355\text{nm}$, $\lambda /2@532\text{nm} + \lambda @355\text{nm}$



Dayoptics Standard Products

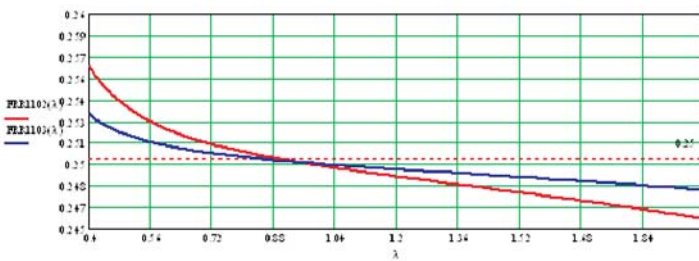
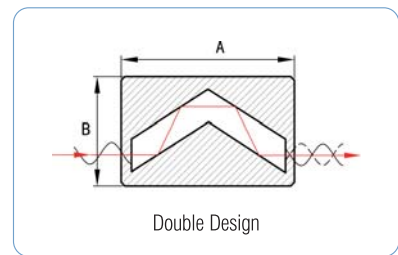
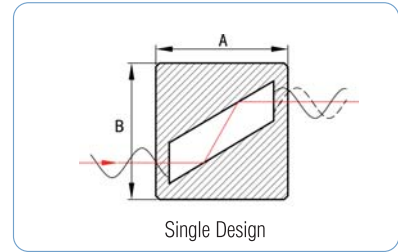
P/N#	Diameter(mm)	Unit Price
WPD210	10.0	\$48
WPD212	12.7	\$58
WPD215	15.0	\$68
WPD220	20.0	\$78
WPD225	25.4	\$88
WPD230	30.0	\$98



FRESNAL RHOMB RETARDER

BK7 Fresnal Rhomb Retarder Specifications

Material	BK7 Grade A Optical Glass
Dimension Tolerance	+0.0,-0.2mm
Clear Aperture	> 80%
Flatness	$\lambda / 10 @ 632.8\text{nm}$
Surface Quality	20/10 Scratch/Dig
Bevel	0.2mm to 0.5mm
Aperature	10x10 mm

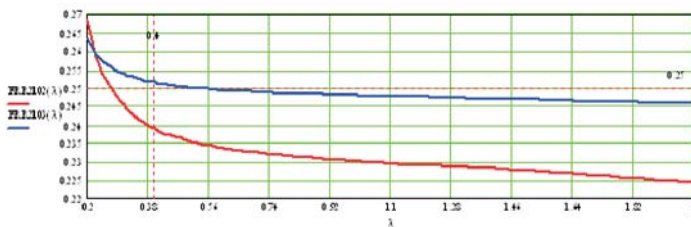
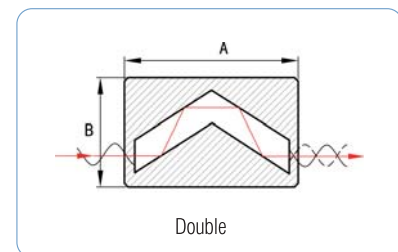
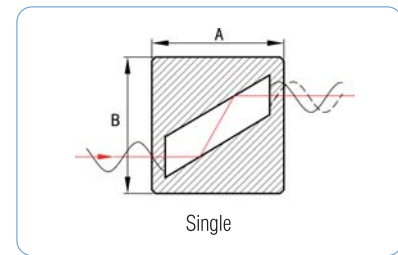


FRR1102, FRR1103 retardation curve

Part No.	Ratardation	Design	Using Wavelength	Mounter Dimension			Unit Price
				A(mm)	B(mm)	H(mm)	
FRR1101	$\lambda / 4$	Single	400-2000nm	35	40	37	\$160
FRR1102	$\lambda / 2$	Double	400-2000nm	64	40	37	\$250
FRR1103	$\lambda / 4$	Double	400-2000nm	140	40	37	\$350

Fused Silica Fresnel Rhomb Retarder Specifications

Material	UV Grade Fused Silica
Dimension Tolerance	+0.0,-0.2mm
Clear Aperture	> 80%
Flatness	$\lambda / 10 @ 632.8\text{nm}$
Surface Quality	20/10 scratch/dig
Bevel	0.2mm to 0.5mm
Aperature	10x10 mm



FRR2102, FRR2103 retardation curve

Part No.	Ratardation	Design	Using Wavelength	Mounter Dimension			Unit Price
				A(mm)	B(mm)	H(mm)	
FRR2101	$\lambda / 4$	Single	200-2000nm	35	40	37	\$220
FRR2102	$\lambda / 2$	Double	200-2000nm	64	40	37	\$380
FRR2103	$\lambda / 4$	Double	200-2000nm	140	40	37	\$480



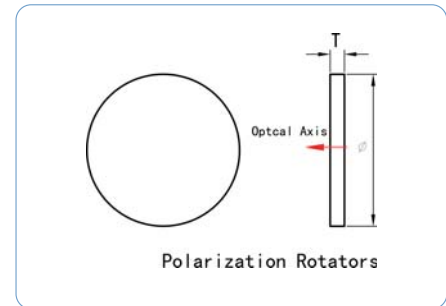
POLARIZATION ROTATORS

Polarization rotators offer 45° or 90° rotation at a number of common laser wavelengths. The optical axis in a polarization rotator is perpendicular to the polished face. The result is that the orientation of in put linearly polarized light is rotated as it propagates through the device.

Specifications

- Wide Angle Acceptance
- Better Temperature Bandwidth
- Wide Wavelength Bandwidth
- AR Coated, R<0.2%

Standard Wavelength: 532nm, 632.8nm, 1064nm



Dayoptics Standard Products

Part No.	Diameter(mm)	Rotation	Unit price
WPR4512	12.7	45°	\$58
WPR4515	15.0	45°	\$68
WPR4520	20.0	45°	\$78
WPR4525	25.4	45°	\$88
WPR9012	12.7	90°	\$98
WPR9015	15.0	90°	\$108
WPR9020	20.0	90°	\$118
WPR9025	25.4	90°	\$128



HOLDERS

Holders for Waveplates

Specifications:

- Material:Black anodized aluminum
- Diameter tolerance: +0 /-0.2mm
- Thickness tolerance: +/-0.1mm



P/N#	Diameter(mm)	Thickness(mm)	Aperture(mm)	CA(mm)	Unit price
WH2510	25.4	6.0	10.0	9.0	\$6
WH2512	25.4	6.0	12.7	11.5	\$6.5
WH2515	25.4	6.0	15.0	13.5	\$7
WH3020	30.0	6.0	20.0	18.0	\$8
WH3025	30.0	6.0	25.4	22.8	\$8.5
WH3830	38.1	6.0	30.0	27.0	\$9

Holders for Waveplates

Specifications:

- Material:Black anodized aluminum
- Rotation tolerance: <math>< 5^\circ</math>
- Diameter tolerance: +/-0.1mm



P/N#	Width	Height	Length	Diameter(ring holder)	Thickness(ring holder)	Unit price
WRH25	40	60	10	25.4	6.0	\$30
WRH30	45	63	10	30.0	6.0	\$35

