

Waveplates

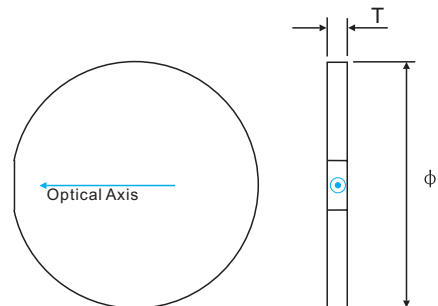
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Multiple Order Waveplates

Multiple order waveplates are made from a single crystalline plate, which are designed to give a retardance of several full waves, plus the desired fraction. Multiple order waveplates are more susceptible to change in wavelength and they should not be used more than several nanometers outside of design wavelength.

General Specifications

Material	Quartz
Dimension tolerance	± 0.1mm
Parallelism	1 arc sec
Surface quality	20-10 S/D
Wavefront distortion	$\lambda/8@632.8\text{nm}$
Retardation accuracy	$\lambda/200$
Clear aperture	>90%
Coating on both sides	$R<0.25\%$ @ design wavelength



Typical Retardation

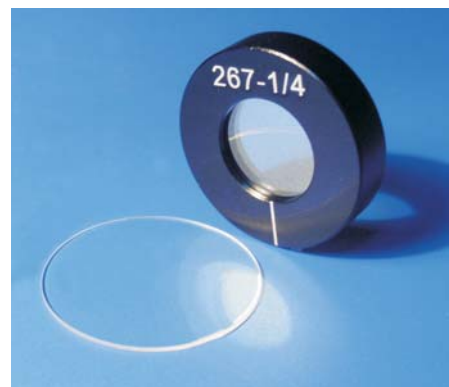
$\lambda/4$	$\lambda/2$	1λ	$\lambda/8$
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Typical Diameters

$\phi 5.0$	$\phi 10.0$	$\phi 12.7$	$\phi 15.0$
$\phi 20.0$	$\phi 25.4$	$\phi 30.0$	$\phi 38.1$

Thickness: approx 0.3~0.5mm

Mounted Waveplates are available, please refer to [Page 59](#) to select a proper holder.



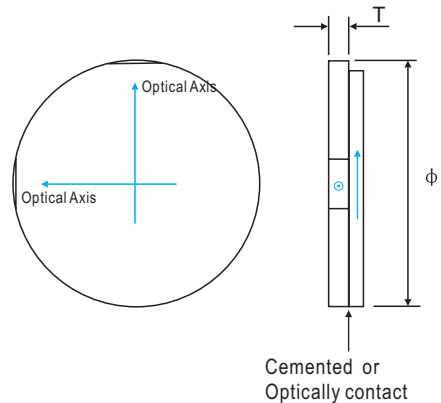
Zero order Waveplates

Zero order waveplates are constructed of two multiple order waveplates with their axes crossed. Thus the effect of the first plate is cancelled by the second, except for the residual difference between them.

Zero order waveplates are much less susceptible to wavelength and temperature changes. Zero-order waveplates are frequently preferred to use despite their somewhat higher cost: They maintain optimum performance across a much larger range of temperatures and wavelengths. For use with laser diodes having variable wavelength, or in instruments that warm up over time, or in locations subject to the environment, their stability is paramount.

General Specifications

Material	Quartz
Dimension tolerance	± 0.1mm
Parallelism	2 arc sec
Surface quality	20-10 S/D
Wavefront distortion	$\lambda/8 @ 632.8\text{nm}$
Retardation accuracy	$\lambda/300$
Clear aperture	>90%
Coating on both sides	$R < 0.25\% @ \text{design wavelength}$



Typical Retardation

$\lambda/4$	$\lambda/2$	1λ	$\lambda/8$
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Typical Diameters

$\phi 5.0$	$\phi 10.0$	$\phi 12.7$	$\phi 15.0$
$\phi 20.0$	$\phi 25.4$	$\phi 30.0$	$\phi 38.1$

Thickness: approx 1.0 ~ 1.5mm

Zero order Waveplates are available in **Cement type** and **optically contact type**.

Cement type: Two parts are cemented with glue.

Optically contact type: The Surfaces of two parts are bonded to each other through the mutual attraction of Van der Waals forces.

How to order waveplate? Example:

Type	Size	Wavelength	Retardation	Coating
Multiple order	$\phi 25.4\text{mm}$	800nm	$\lambda/2$	AR

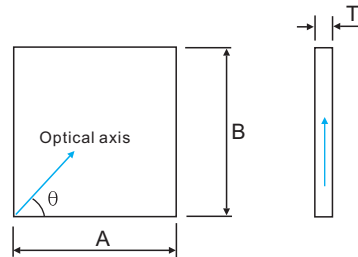
- Price on request
- Custom Design
- Volume Discount

True Zero Order Waveplates

True order waveplate is designed for wavelength range 1300-- 1700nm for telecom application. These waveplates provide best possible angle, temperature and wavelength performance. The thickness of these waveplates are very thin (approx 100 μ m).

General Specifications

Material	Quartz
Dimension tolerance	± 0.1mm
Parallelism	1 arc sec
Surface quality	20-10 S/D
Wavefront distortion	$\lambda/8@632.8\text{nm}$
Retardation tolerance	$\lambda/300$
Clear aperture	>90%
Coating on both sides	R<0.25% @ design wavelength



typical $\theta = 22.5^\circ, 45^\circ$

Typical Sizes

Square	Round	Thickness
1.0x1.0	ϕ 1.0	0.03--0.10
2.0x2.0	ϕ 2.0	0.03--0.10
3.0x3.0	ϕ 3.0	0.03--0.10
5.0x5.0	ϕ 5.0	0.03--0.10

Thickness: approx < 0.1mm

Typical Retardation

$\lambda/4$	$\lambda/2$
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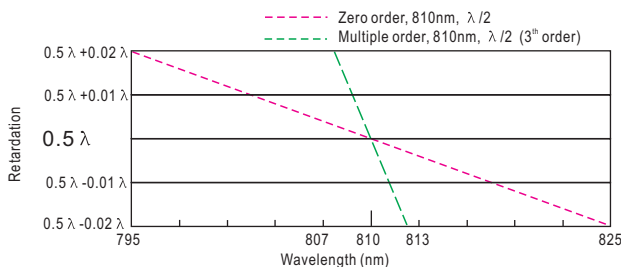
How to order true zero order waveplate? Example:

Type	Size	Wavelength	Retardation	Coating
True zero order	2x2mm	1550nm	$\lambda/2$	AR

- Price on request
- Custom Design
- Volume Discount

Comparison of Multiple order Waveplate and Zero order waveplate:

Retardation vs. Wavelength



Retardation vs. Temperature

Temperature change from 10°C to 35°C

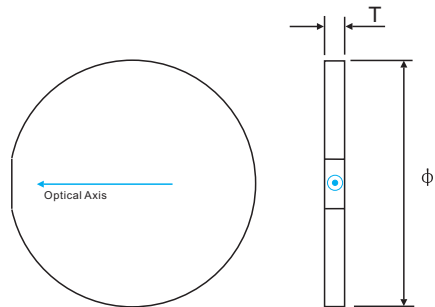
	Variation of Retardation
Zero order $\lambda/2, 633\text{nm}$	$\Delta 0.02 \lambda$
7 th order $\lambda/2, 633\text{nm}$	$\Delta 0.65 \lambda$

Dual Wavelength Waveplates

Dual wavelength waveplates are multiple order waveplate that provide a specific retardance at two different wavelengths. Its application is separation of different wavelengths with a polarization beamsplitter by rotating the polarization of one wavelength by 90°, and leaving the other unchanged.

General Specifications

Material	Quartz
Dimension tolerance	± 0.1mm
Parallelism	1 arc sec
Surface quality	20-10 S/D
Wavefront distortion	$\lambda/8@632.8\text{nm}$
Retardation tolerance	$\lambda/100$
Clear aperture	>90%
Coating on both sides	R<0.25% @ design wavelength



Typical Retardation

$\lambda/4$	$\lambda/2$	1λ
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Typical Diameters

φ 5.0	φ 10.0	φ 12.7	φ 15.0
φ 20.0	φ 25.4	φ 30.0	φ 38.1

Thickness: approx 1.0~2.0mm

How to order dual wavelength waveplate? Example:

Type	Size	Wavelength-1 Retardation	Wavelength-2 Retardation	Coating
Dual wavelength	φ 25.4mm	532nm- $\lambda/2$	1064nm- 1λ	AR

- Price on request
- Custom Design
- Volume Discount

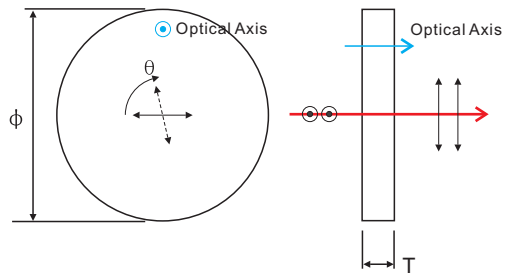
Polarization Rotators

Crystal quartz plate with optical axis perpendicular to surfaces can rotate the plane of polarization of an input beam of light. The rotation angle at a particular wavelength is a function of thickness of crystal quartz.

With particular thickness the quartz plates can rotate the plane of polarization of incident linearly polarized single wavelength of light by 45 or 90 degrees.

General Specifications

Material	Quartz
Dimension tolerance	$\pm 0.1\text{mm}$
Parallelism	10 arc sec
Surface quality	20-10 S/D
Wavefront	$\lambda/4@632.8\text{nm}$
Rotate tolerance	<5 arcmin
Clear aperture	>90%
Coating on both sides	AR coating



How to order polarization rotator? Example:

Type	Size	Wavelength	Rotate Angle	Coating
Rotator	$\phi 25.4\text{mm}$	1064nm	90°	AR

Price on request

Custom Design

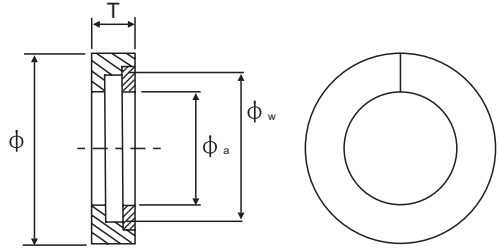
Volume Discount

HOLDERS For Waveplates

The holders are designed to mount waveplates.

Specifications

Material: Black anodized aluminum
 Dimension tolerance: $\pm 0.1\text{mm}$



Item#	Holder ϕ (mm)	Holder T (mm)	Waveplate ϕ_w (mm)	Clear aperture ϕ_a (mm)
WH-01	ϕ 25.4	6.0	10.0	8.0
WH-02	ϕ 25.4	6.0	12.7	10.5
WH-03	ϕ 25.4	6.0	15.0	13.5
WH-04	ϕ 30.0	6.0	20.0	18.0
WH-05	ϕ 30.0	6.0	25.4	23.0

