

**Waveplates** and retardation plates are optical elements with two principal axes, one slow and one fast, that resolve an incident polarized beam into two mutually perpendicular polarized beams. Their operation is based on birefringent linear effect, which is the difference in the refractive indices for the beams with parallel and normal polarization towards the optical axis of the crystalline quartz material being within the waveplate plane. The emerging beam recombines to form a particular single polarized beam.



The most common types of waveplates are quarter-wave plates ( $\lambda/4$  plates) and half-wave plates ( $\lambda/2$  plates), where the difference of phase delays between the two linear polarization directions is  $\pi/2$  or  $\pi$ , respectively, corresponding to propagation phase shifts over a distance of  $\lambda/4$  or  $\lambda/2$ , respectively.



## Some important cases are:

When a light beam is linearly polarized, and the polarization direction is along one of the axes of the waveplate, the polarization stays unchanged.

When the incident polarization does not coincide with one of the axes, and the plate is a half-wave plate, then the polarization stays linear, but the polarization direction is rotated. For example, for an angle of  $45^\circ$  against the axes, the polarization direction is rotated by  $90^\circ$ .

When the incident polarization is at an angle of  $45^\circ$  against the axes, a quarter-wave plate generates a state of circular polarization. (Other input polarizations lead to elliptical polarization states.) Conversely, circularly polarized light is converted into linearly polarized light.

## Specification:

<b>Material:</b>	Quartz
<b>Parallelism:</b>	<1 arc second
<b>Diameter Tolerance:</b>	+0.0, -0.1mm
<b>Surface Quality:</b>	20/10
<b>Retardation Tolerance:</b>	$\lambda/500$
<b>Wavelength Distortion:</b>	$\lambda/8@632.8\text{nm}$
<b>Clear aperture:</b>	central 90%
<b>AR Coated:</b>	S1&S2: R<0.2% @ wavelength
<b>Standard wavelength:</b>	266nm, 355nm, 532nm, 632.8nm, 780nm, 808nm, 850nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm

Other wavelengths within the range of 200–2300 are also available upon request. Various ring mounts and rotating holders for waveplates are available upon request.