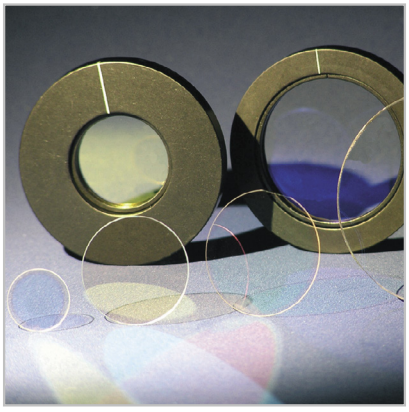
LASER COMPONENTS®

Waveplates



Waveplates – also known as "retardation plates" – are optical elements that create a phase shift in the transmitted light with the help of birefringency crystalline quartz. The desired retardation is achieved by varying the plate thickness and the alignment inside the beam path.

A phase shift of 90° is referred to as a λ/4 plate, quarter wave plate, or a circular polarizer; whereas a phase difference of 180° is referred to as a λ/2 or half wave plate.

LASER COMPONENTS' waveplates have a flattened side for easier orientation of the beam polarisation. It is perpendicular to the optical axis.

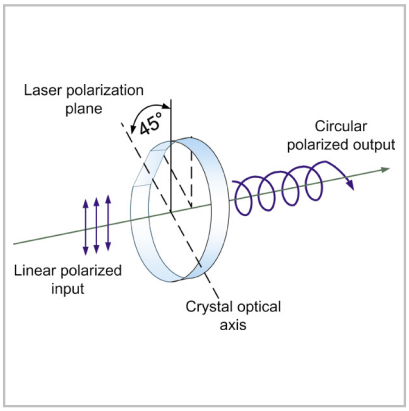
In addition to the variety of waveplates used in laser technology and described in the following, LASER COMPONENTS also has ultra-thin and micro waveplates available that are commonly used in the field of telecommunications. These plates are custom made according to your requirements.

There are three main types of waveplates: multiple order, low order, and zero order. The fundamental difference between these plates is the stability of the retardation tolerance across the wavelength range. This tolerance is a function of spectral range, product type, and design thickness.

All waveplates are normally equipped with an AR coating that is optimized for one wavelength λ.

Overview

- **λ/4 Plates**
  λ/4 plates are used to derive circularly polarized light from linearly polarized light and vice versa. For this purpose, the polarization of the incident beam must be at a 45° angle to the optical axis. Elliptically polarized light is produced if the angle is different. If the direction of polarization of the incident light is parallel to the optical axis, the light will simply get phase shifted.



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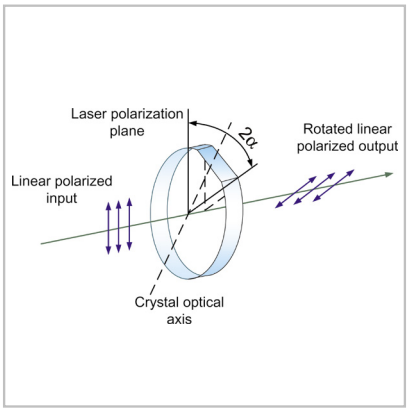
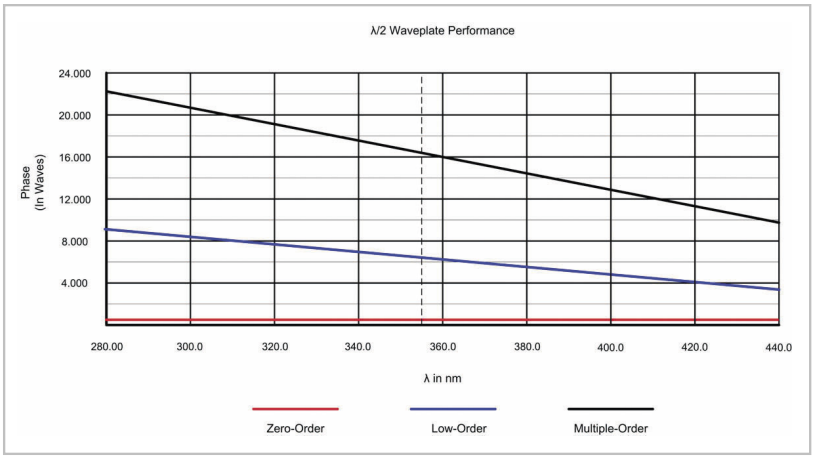
- **λ/2 Plates**
  λ/2 plates change the direction of polarization of linearly polarized light. An angle α between the optical axis and the direction of polarization of the incident beam results in a rotation of polarization by 2α. The angle α = 45° is the most commonly used. Here s-pol light is converted to p-pol light and vice versa.

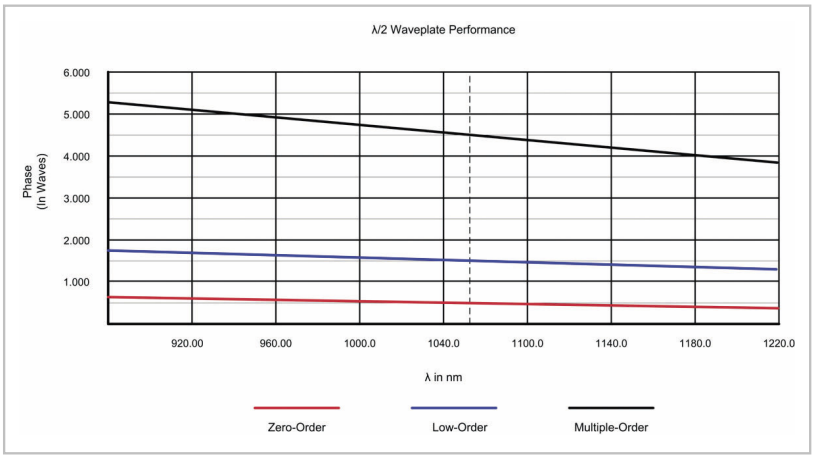


Versions for a half wave plate centered at 1064 nm and 355 nm are represented in the following graphics. They show that zero order and low order plates behave very similarly in systems of long wavelengths.

A low order plate is much thinner than a zero order plate consisting of two multiple order plates. This makes the handling of low order plates critical; however, since there is only one plate needed, they are less expensive.



Different types of λ/2 waveplates; optimized for 355 nm



Different types of λ/2 waveplates; optimized for 1064 nm

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