

## 2.2. Zero-order or Low-order waveplates (retardation plates)



To suit different applications, air spaced, glued or optically contacted Zero Order compensated phase retardation plates are available. Waveplates are made from materials which exhibit birefringence. The velocities of the extraordinary and ordinary rays through the birefringent material varies inversely with their refractive indices. This difference in velocities gives rise to a phase difference when the two beams recombine. At any specific wavelength the phase difference is governed by the thickness of the retarder - waveplate.

**L/2 Waveplates.** A linearly polarized beam incident on a half wave crystal quartz 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 to rotate the plane of polarization, electro-optic modulation and as a variable ratio beamsplitter when used in conjunction with a polarization cube.

**L/4 Waveplates - thin-film compensators.** If the angle 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 waveplate are used in creating circular polarization from linear or linear polarization from circular, ellipsometry, optical pumping, suppressing unwanted reflection and optical isolation. Zero Order waveplates are generally preferred since they are least sensitive to variations in wavelength, angle of incidence and temperature. Air-spaced crystal quartz waveplates are also available. Its performance is as good as cemented zero-order waveplate. Additionally, the air-spaced construction enables it is suitable for the high power laser application. The damage threshold is more than 500 MW/cm<sup>2</sup>.

### Standard specifications

Wavelength: 240-2000nm
Material: Crystalline Quartz
AR/AR coated, R < 0.2% at each surface
Surface finish: 20/10 scr/dig
Retardation tolerance: L/500 @ 20 deg C
Wavefront distortion: L/10, wedge 3"
Damage threshold, typical: > 500 MW/cm <sup>2</sup> , or > 5 J/cm <sup>2</sup>
Mounted: 1", 1.5" or 2" diameter

### When Ordering please specify

Wavelength: 240-2000nm
Retardation phase: L/2 or L/4
AR/AR coatings: <u>Coated</u> or Uncoated
Mounted: 1", 1.5", 2" or <u>Unmounted</u>

### 2.2.1. ZO Waveplates

Code	Name	Order	CA (mm)	Price (1-3pcs)	Price (4-9pcs)	Price (10-25pcs)	Currency
WP1	Waveplate	ZO	10	51,000	48,600	45,900	JPY
WP13	Waveplate	ZO	12.7	52,500	49,800	47,400	JPY
WP3	Waveplate	ZO	15	57,000	54,300	51,300	JPY
WP4	Waveplate	ZO	20	63,000	60,000	56,700	JPY
WP5	Waveplate	ZO	25.4	78,000	74,700	71,400	JPY
WP6	Waveplate	ZO	30	109,500	93,600	89,400	JPY
WP7	Waveplate	ZO	35	141,000	134,100	126,000	JPY
WP8	Waveplate	ZO	40	180,000	171,000	156,000	JPY
WP9	Waveplate	ZO	50	228,000	204,000	198,000	JPY

### 2.2.2. LO Waveplates

Code	Name	Order	CA (mm)	Price (1-3pcs)	Price (4-9pcs)	Price (10-25pcs)	Currency
WP30	Waveplate	LO	10	28,500	27,000	25,500	JPY
WP42	Waveplate	LO	12.7	30,000	28,500	27,000	JPY
WP32	Waveplate	LO	15	34,500	32,700	31,200	JPY
WP33	Waveplate	LO	20	37,500	35,700	33,900	JPY
WP34	Waveplate	LO	25.4	48,000	45,600	43,200	JPY
WP35	Waveplate	LO	30	69,000	65,700	62,100	JPY
WP36	Waveplate	LO	35	108,000	102,600	97,200	JPY
WP37	Waveplate	LO	40	123,000	117,000	110,700	JPY
WP38	Waveplate	LO	50	150,000	141,000	132,000	JPY