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# POLARIZING OPTICS

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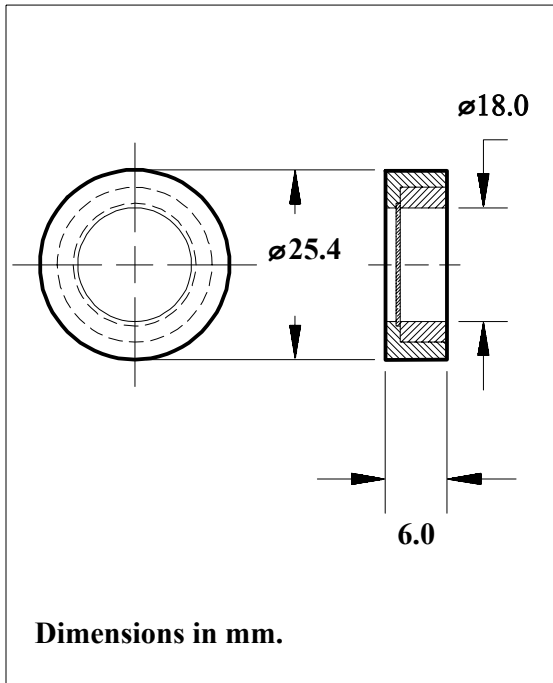
**DDC TECHNOLOGIES**

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**FEATURES**

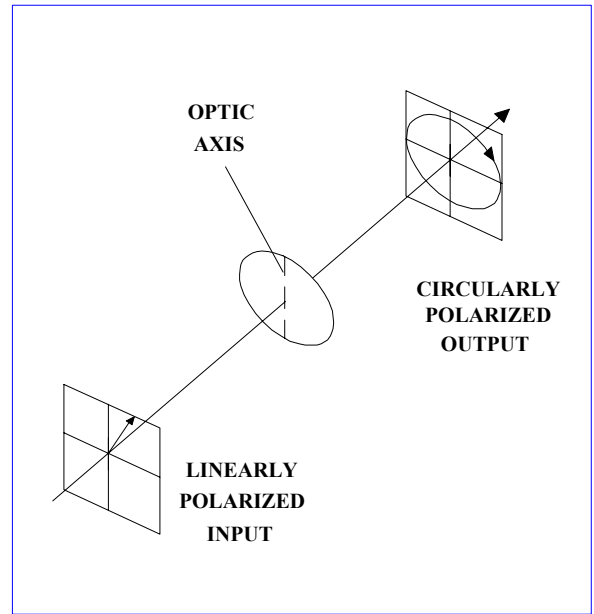
- \* Low loss
- \* High handling power
- \* Minimal wavefront distortion
- \* Exact phase retardation
- \* Supplied in one inch cylindrical mount



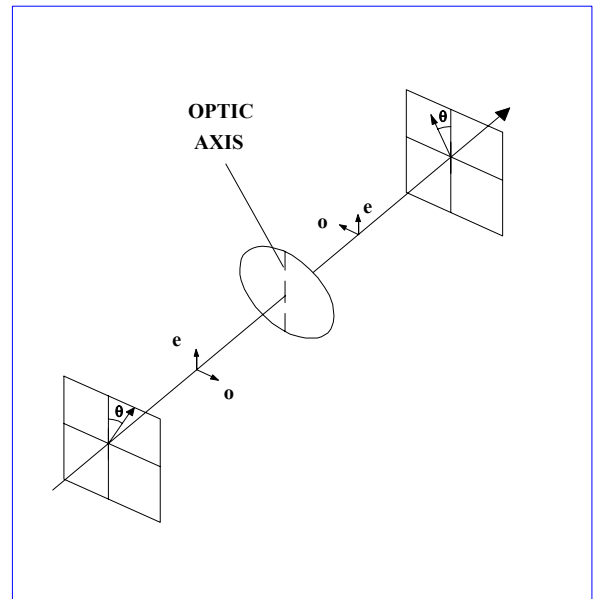
**Fig. 7** Technical details of DDC Technologies Retardation Plates.

**APPLICATIONS**

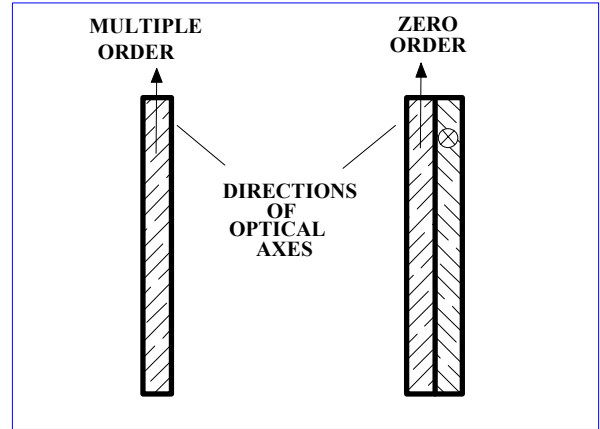
- \* 1/4 wave retarders convert linear polarization to circular and vice versa
- \* 1/2 wave retarders rotate the plane of polarization at an adjustable angle or change the handedness of circularly polarized light



**Fig. 8** Quarter wave Retardation Plate.



**Fig. 9** Half wave Retardation Plate.



**Fig. 10 Types of Retardation Plates.**

**MULTIPLE ORDER  
RETARDATION PLATES**

**DESIGN**

DDC Technologies multiple order quartz plates are single quartz plates having the retardance at the specified wavelength equal to an integral number of waves plus 1/4 or 1/2 wave. DDC Technologies plates are only approximately 0.4 mm thick, so they are low order plates with good bandwidth acceptance angle and temperature characteristics.

**SPECIFICATIONS**

Standard tolerance at 20°C	1 degree
Wavefront distortion	1/10 wave
Construction	Single plate
Anti-reflecting coating	<0.25% refl. per face
Aperture	18 mm
Material	Highly selected crystal quartz

Wavelength (nm)	Quarter-wave		Half-wave	
	Model	Price	Model	Price
351	15120	\$225	15320	\$225
354.7	15130	\$225	15330	\$225
441.6	15140	\$225	15340	\$225
488.0	15150	\$195	15350	\$195
514.5	15160	\$195	15360	\$195
532	15170	\$195	15370	\$195
632.8	15180	\$195	15380	\$195
647.1	15190	\$195	15390	\$195
694.3	15200	\$195	15400	\$195
1064	15210	\$195	15410	\$195



**ZERO ORDER  
RETARDATION PLATES**

**DESIGN**

DDC Technologies zero order plates are made by contacting together two crystal quartz plates, one with retardance in one direction and the other to compensate for all this retardance but 1/4 or 1/2 wave. Optical contacting minimizes interface loss and deviation.

**SPECIFICATIONS**

Standard tolerance at 20°C	1 degree
Wavefront distortion	1/10 wave
Construction	Optically contacted double plate
Anti-reflecting coating	<0.25% refl. per face
Aperture	18 mm
Material	Highly selected crystal quartz

Wavelength (nm)	Quarter-wave		Half-wave	
	Model	Price	Model	Price
351	15520	\$320	15720	\$320
354.7	15530	\$320	15730	\$320
441.6	15540	\$320	15740	\$320
488.0	15550	\$295	15700	\$295
514.5	15560	\$295	15760	\$295
532	15570	\$295	15770	\$295
632.8	15580	\$295	15780	\$295
647.1	15590	\$295	15790	\$295
694.3	15600	\$295	15800	\$295
1064	15610	\$295	15810	\$295

Contact DDC Technologies for retarders at other wavelength, or with other apertures, or for non standard retardance values.



**Fig. 11 15920 Polarizing Combiner.**

DDC Technologies Polarizing Combiner is used to convert the input plane polarized light into one of four output polarization states: plane vertical (V), plane horizontal (H), right-hand circularly-polarized (R), left-hand circularly-polarized (L), according to the table:

X1	X2	
0	0	<b>V</b>
1	0	<b>H</b>
0	1	<b>R</b>
1	1	<b>L</b>

The device consists of two waveplates: half-wave (X1) and quarterwave (X2), which can be independently rotated 45 degrees around the beam axis. In the table above "0" corresponds to "off" position while "1" to "on" position. We offer Polarizing Combiners both zero-order and multi-order waveplates.

**SPECIFICATIONS**

Standard tolerance at 20°C      2 degree  
 Wavefront distortion            1/5 wave  
 Anti-reflecting coating          <0.25% refl. per face  
 Clear aperture                      18 mm

Wavelength (nm)	Multiorder		Zero order	
	Model	Price	Model	Price
351	15905		15955	
354.7	15907		15957	
441.6	15910		15960	
488.0	15912		15962	
514.5	15915		15965	
532	15917		15967	
632.8	15920		15970	
647.1	15922		15972	
694.3	15925		15975	
1064	15927		15977	

Contact DDC Technologies for other types of polarizing devices.



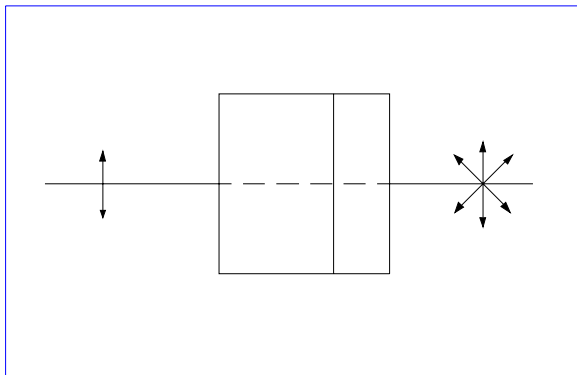
**FEATURES**

- \* Eliminate spurious polarization dependent result
- \* Monochromatic and wideband versions
- \* Supplied in one inch mounts

**DEPOLARIZERS FOR POLYCHROMATIC LIGHT**

These devices are Lyot depolarizers consisting of two plane parallel calcite or crystal quartz plates. The plates have an exact thickness ratio 2:1 and are optically contacted so that the fast axes, which are in the surface of the plates, form an angle of 45 degrees. Transmission band is from 200 to 2500nm for quartz and from 250 to 2000nm for calcite depolarizers.

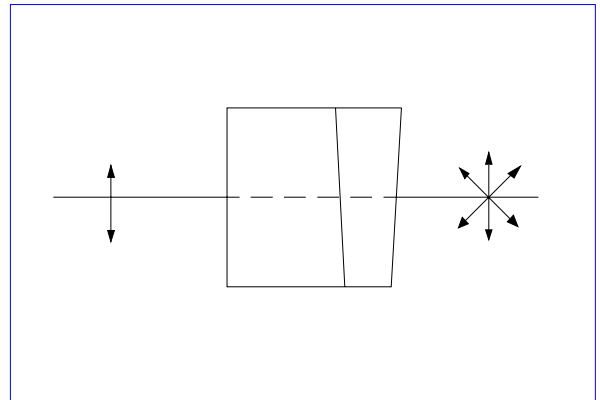
The output is depolarized when the average is taken over the spectrum. Again, the residual polarization depends on the input but should not be more than 3% in the worst case at the specified bandwidth.



**Fig. 13 Depolarizer for polychromatic light.**

**WEDGE DEPOLARIZERS**

This device consists of a 3 degree crystal quartz wedge with a second compensating fused silica wedge. The wedges are optically contacted for minimum loss from 200 to 2500nm and high power handling. The polarization content of the output depends on the polarization and spatial characteristics of the input. The device is ideal to be mounted at the input or output of monochromators with the wedge aligned along the slit.



**Fig. 14 Wedge Depolarizer.**

**SPECIFICATIONS**

Surface finish: 20-10 grade  
 Wavefront distortion: 1/10 wave  
 Clear aperture: 15 mm

Model	Bandwidth (nm)	Material	Price
15005	1000	quartz	
15010	200	quartz	
15015	15	calcite	
15050	Wedge	quartz	

Contact DDC Technologies for other types of polarizing devices.



Fig. 15 Model 16030 Glan Polarizer.

**FEATURES**

- \* Highest extinction ratio
- \* Air spaced for laser applications
- \* Supplied in cylindrical mounts

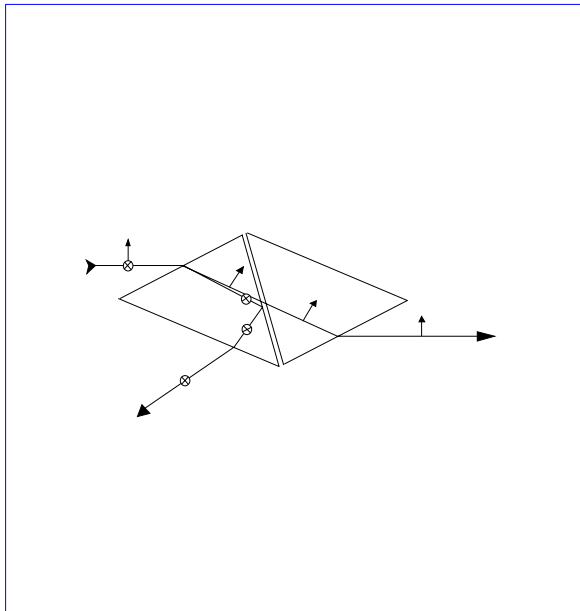


Fig. 16 Low loss prism.

**DESIGN**

DDC Technologies Glan Polarizers have the Glan Taylor design. A special prism with Brewster angle entrance and exit faces and Brewster angle polarizing

interface (in order to maximize the transmission characteristics) is available.

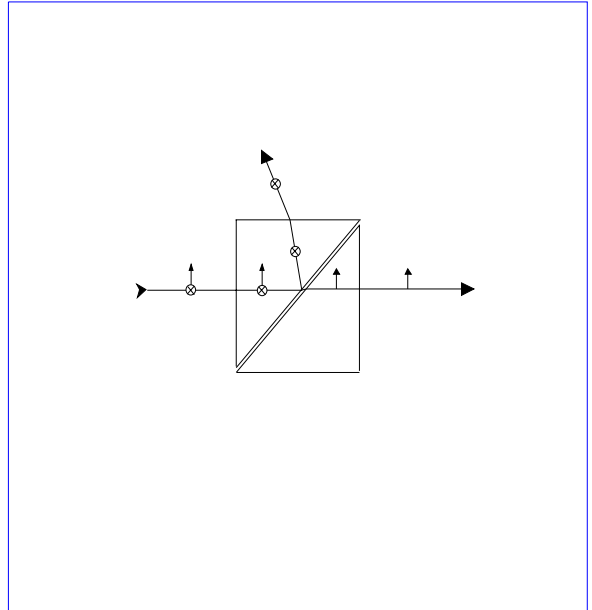


Fig. 17 High Power Prism.

**TYPES**

- \* High power laser prism
- \* Ultraviolet prism
- \* Low loss prism (Brewster angle)

**SPECIFICATIONS**

Extinction ratio:	Better than 1:100000
Angle of acceptance:	$\pm 4$ degrees
Beam deviation:	Less than 3 minutes of arc
Uncoated transmission:	88% for transmitted polarization

Model	Type	Aperture (mm)	Price
16010	high power	7	
16020	high power	10	
16030	high power	12	
16040	high power	15	
16050	ultraviolet	7	
16060	ultraviolet	10	
16070	ultraviolet	12	
16080	ultraviolet	15	
16090	low loss	10	
16095	low loss	15	

Contact DDC Technologies for other types of polarizing devices

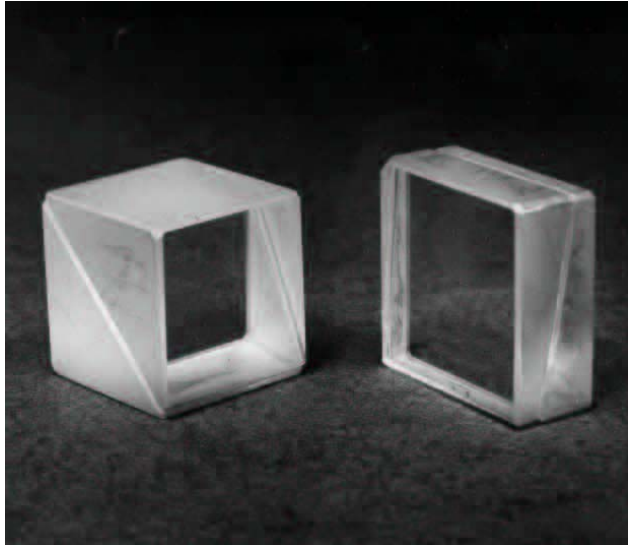


Fig. 18 16240 Wollaston Polarizer.

DDC Technologies Wollaston Prism Polarizers consists of two equal calcite prisms optically coupled so, that the directions of optical axes are orthogonally crossed. The two output beams are polarized orthogonally and are almost equally deviated, angular separation depending on wave length. In case you need the separation of two output beams greater than 20 degrees, we recommend you a three element Wollaston prism. The transmission range of DDC Technologies Wollaston Prism glued by optical cement is from 300nm to 2200nm. The extinction ratio is better than  $10^{-5}$ .

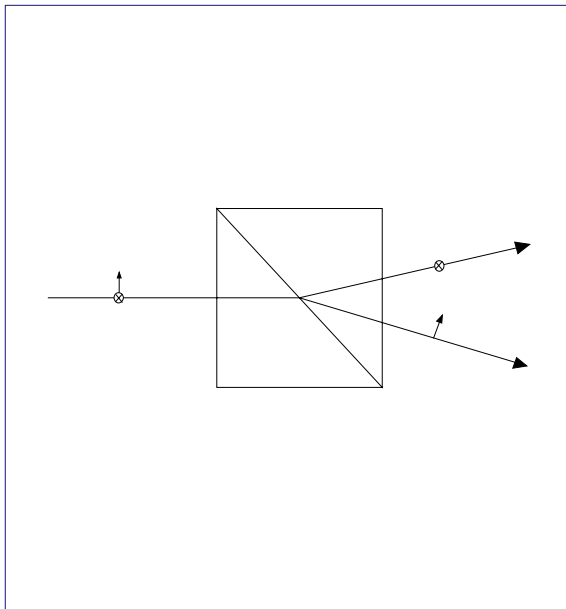


Fig. 19 Two element Wollaston Polarizer.

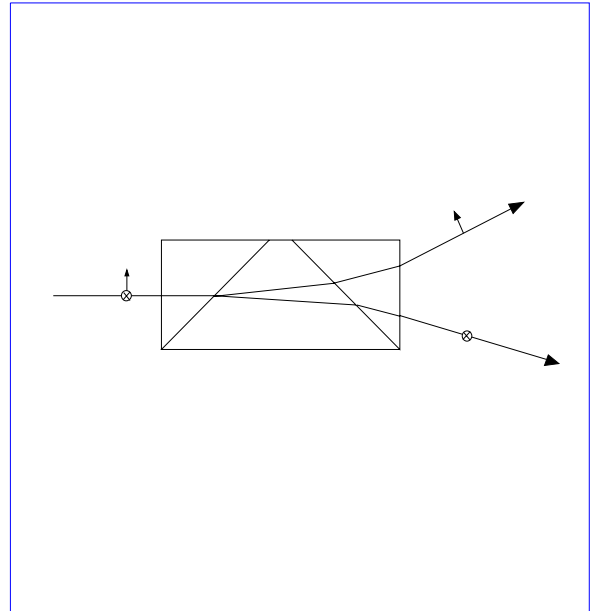


Fig. 20 Three element Wollaston Polarizer.

Model	Aperture (mm)	Angular separation (degrees)	Price
16205	10	5	
16210	10	10	
16215	10	15	
16220	10	20	
16225	12	5	
16230	12	10	
16235	12	15	
16240	12	20	
16245	15	5	
16250	15	10	
16255	15	15	
16260	15	20	
16265	20	5	
16270	20	10	
16275	20	15	
16280	20	20	

**THREE ELEMENT WOLLASTON**

Model	Aperture (mm)	Angular separation (degrees)	Price
16300	12	25	
16310	12	30	

Contact DDC Technologies for other types of polarizing devices.