CORNING

Corning® Polarcor™ FAQs

Manufacturing Capabilities

What is the standard thickness?

For high contrast Polarcor, standard thickness' are 0.2 mm and 0.5 mm.
For UltraThin, standard thickness is 0.03 mm.

What are the standard sizes?

Standard sizes are shown on the price list. Other sizes are available on special order. Maximum size varies with product wavelength, polarization axis and thickness.

What is the largest part available at 45 degrees?

For 1310 nm and 1550 nm wavelengths, the largest available part is 15 mm x 15 mm. For 633 nm through 1060 nm wavelengths, the largest available part is 20 mm x 20 mm.

Is Polarcor available with a wider polarization bandwidth than your stock offering?

Wider polarization are available on a special order basis only.

Can I cut Polarcor? If so, how?

Polarcor can be cut in the same manner as any glass. Slicing with a diamond saw typically yields the best results.

Will parts work outside the clear aperture... all the way to the edge?

Polarcor will polarize light across the entire surface of the part, however, the contrast ratio specification is only guaranteed within the clear aperture. Visual and coating specifications are also only guaranteed within the clear aperture.

Can you produce material with more than one axis of polarization? (e.g. Usually at right angles)

No. However, two or more Polarcor parts can be placed side-by-side and laminated to a clear glass substrate to yield the desired effect.

Can you improve on the reflectivity of your stock products?

No. However, parts with less than 0.25% are available on a special order basis. In most cases, the entire cost of a special coating run will be applied to the order.

What happens to contrast ratio if I remove the polarization layer from one side?

To approximate the contrast ratio if the polarization layer is removed from one side, take the square root of the contrast ration with both sides polarized. Please note that the only way to eliminate the polarization angle on one side is to first lap, then polish the glass surface.

Properties

Thermal expansion Coefficient:	6.5 x 10^{-6} / °C
Knoop Hardness	480 Kg / mm^2
Young's Modulus	58.605 GPa (8.5 x 10^6 psi)
Poisson's Ratio	0.21
Abbe Constant	57.6
Brewster's Angle	56.3°
Index of Refraction	1.521 – 1.505
Density	2.412 g/cm^3

What is the thermal conductivity if your Polarcor material?

Thermal conductivity is calculated from the glass composition. The stated accuracy of this calculation (from 1996) is ± 5%. These values are:

Temperature (°C)	**Thermal Conductivity** (cal-cm)(cm^2-sec-C)
1	0.0024
100	0.0027
200	0.0030
300	0.0033
400	0.0035
500	0.0038
600	0.0043

What is the specific heat (Cp) of your Polarcor material?

We do not have a measurement or a calculation for specific heat for Polarcor. However, there is a fairly good relationship between density (2.412 g/cm^3) and specific heat, which yields an estimate of 770 J/(kg-K) for the glass composition. Most glasses have fairly similar values for specific heat, (varying only 5% or so, over a wide range in density) so this is probably a close enough estimate.

What is the composition of the glass?

Polarcor is a borosilicate glass that contains titanium, aluminum and silver. The polarizing mechanism is elongated silver crystals in the outer 20 μm – 50 μm of the glass surface.

Why does the maximum transmission go down as center wavelength goes down?

The glass is a photochromic material, which darkens with exposure to ultraviolet and visible light. As the center wavelength approaches the visible spectrum, transmission decreases.

What is contrast ratio?

Contrast ratio is the expression used to characterize the efficiency of Polarcor polarizers. It is the ratio of the transmittance of a beam of polarized light aligned with the pass direction of the polarizer (K1) versus the transmittance when the polarizer is turned 90 degrees. The higher the contrast ratio, the higher the performance of the polarizer. Polarcor polarizers are typically greater than 10,000:1 contrast ratio.

What is the relationship between contrast ratio and thickness?

For glass thickness of 0.2 mm or greater the glass thickness itself does not significantly affect contrast ratio.

What is the relationship between insertion loss and thickness?

Insertion loss increases (i.e. transmission decreases) as thickness increases. This effect is more significant at lower wavelengths (630 nm – 700 nm) than higher wavelengths (1300 nm – 1550 nm).

Product Description

Is Polarcor a film that is applied to the surface of the glass?

No. Polarcor is a solid piece of borosilicate glass. A proprietary polarization process makes the outer surfaces act as polarizers. Active polarization occurs in the outer 20 μm - 50 μm of the glass surface.

Why do you call Polarcor a dichroic polarizer?

In optics, there are two uses for the term dichroic:

1. In reference to anisotropic materials, it refers to the selective absorption of light which vibrates in a particular plane relative to the crystalline axis of the material.
2. In reference to isotropic materials, it describes the selective reflection and transmission of light as a function of wavelength, regardless of the plane of vibration.

Polarcor is an anisotropic material (due to the elongated silver particles) so the first definition applies

Can you do this process on other glass?

No. The Polarcor process is a unique glass composition and is manufactured using a proprietary process. It is not possible to use this process with other glass compositions.

Durability

What are the durability conditions that Polarcor can withstand?

Uncoated Polarcor has been subjected to the following conditions with no adverse effects on its performance.

High Temperature	400 °C
Damp Heat	85 °C, 95% relative humidity for 1000 hours
Thermal Cycling	125 °C to -55 °C over 2 hour cycle for 500 hours
Dry Storage	125 °C for 1000 hours, -55 °C for 1000 hours

Miscellaneous

How can I get a sample?

Free samples are not normally available. However, quantities as low as one piece can be purchased from the Standard Products Price List.

Can you make Polarcor that works throughout the visible spectrum?

No.

Can you produce Polarcor with selective regions that do not polarize light?

Yes. We have the capability to manufacture parts with non-polarized regions of a shape and size specified by the customer.

Can I buy Polarcor mounted for use on an optical bench?

Corning does not mount Polarcor, however, a limited range of mounted Polarcor are available from Newport Corporation. Call or visit their website at 1-800-222-6440 or www.newport.com.

Is Polarcor certified for use in space?

Not specifically, however, Polarcor has been used in several space applications, notably NICMOS, THE Hubble Telescope upgrade, the Cassini Deep Space Probe and other.

How do you recommend that I clean Polarcor?

Polarcor can be cleaned with alcohol, acetone, and similar solvents, however these dry quickly and may leave a residue. We have found that a mild soap and water wash followed by a deionized water rinse generally is sufficient, without leaving residue. Immediately spin dry or wipe to avoid spotting.

Does Polarcor have a shelf life?

When stored in a clean container, in a reasonable ambient temperature, shelf life is unlimited.