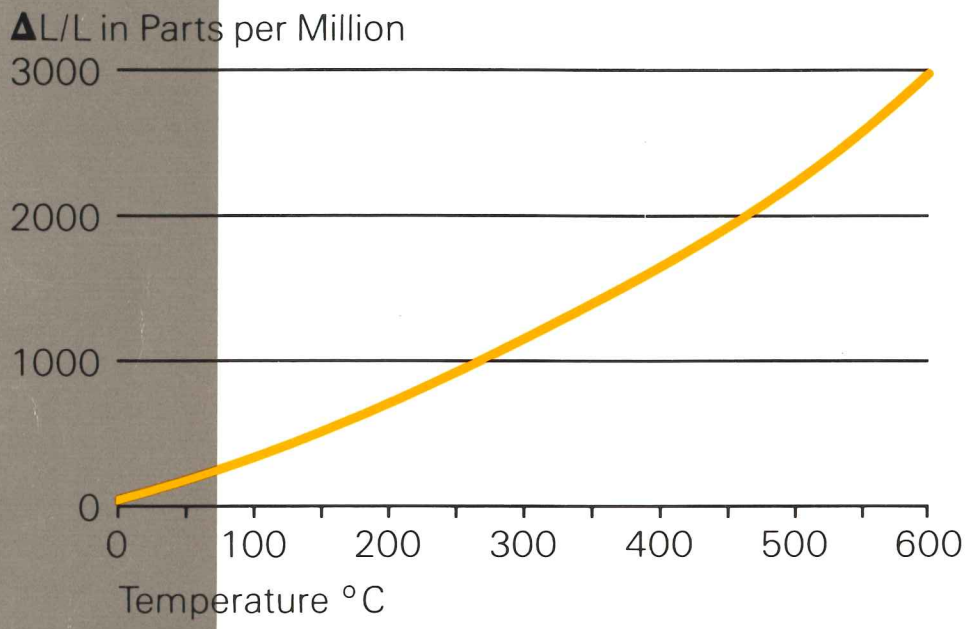
PYREX®

Glass Code 7740

Industrial Supplies

CORNING



32.5×10^{-7} cm/cm/°C

Introduction

Corning's glass code 7740 glass is a borosilicate composition that is used in the PYREX® brand products to provide unique chemical, thermal, mechanical and optical properties. These properties enable it to provide long service and fulfill requirements which common window or container glass cannot meet.

PYREX code 7740 is available as tubing, rod, flat glass, sight glass, bell jars, cylinders, ground and screened glass, and as miscellaneous pressed and blown ware.

Basic Properties

Because of its borosilicate composition, PYREX code 7740 glass resists attack by all acids except hydrofluoric and hot phosphoric. Surface clouding and erosion may occur in the presence of hot caustic solutions.

The low coefficient of thermal expansion of PYREX code 7740 glass allows it to withstand higher temperatures and temperature excursions than ordinary window glass.

Design stresses of up to 1000 psi in tension are allowable in commercially annealed PYREX code 7740 glass. The tempering of 7740 glass allows design stresses up to 3000 psi in tension and improves thermal shock resistance. PYREX 7740 glass, once tempered, cannot be altered or refabricated.

The spectral band width of PYREX code 7740 glass is greater than soda lime glass resulting in higher transmissions of both infrared and ultraviolet energies.

Due to its boron content, PYREX code 7740 glass can be used as a neutron absorber in nuclear applications such as poison rods and raschig rings.

PYREX code 7740 glass meets all glass material requirements stated in MIL-G-47033 (MI) Glass Borosilicate.

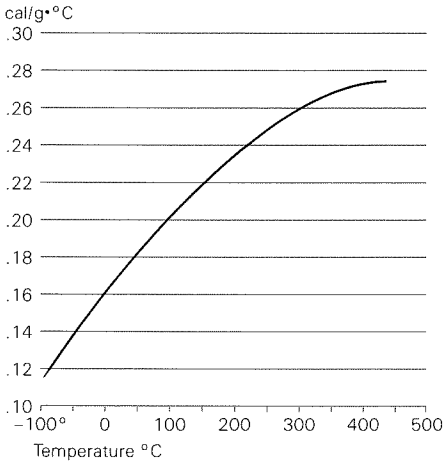
In all cases, before placing a Corning PYREX brand product into your process, read the Use and Care *section of the product catalog and the* Use and Care *sheet provided with the product. Pay strict attention to installation and maintenance instructions, maximum use criteria, cautionary messages, and WARNINGS.*

Thermal Properties

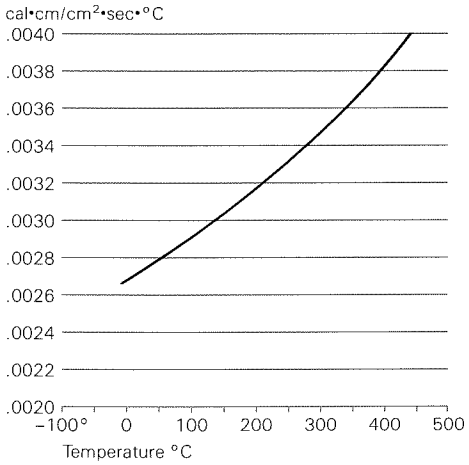
Representative Thermal Values

Average thermal expansion coefficient, 0-300°C	32.5 x 10^{-7} cm/cm/°C	18 x 10^{-7} in/in/°F
Specific heat, 25°C	0.18 cal/g•°C	0.18 Btu/lb•°F
Thermal diffusivity, 25°C	.0069 cm^2/sec	0.00107 in^2/sec
Thermal conductivity, 25°C	.0027 cal•cm/cm^2•sec•°C	0.63 Btu•ft/h•ft^2•°F
Total normal emissivity, 100°C	0.89	
Total hemispherical emissivity, 100°C	0.84	

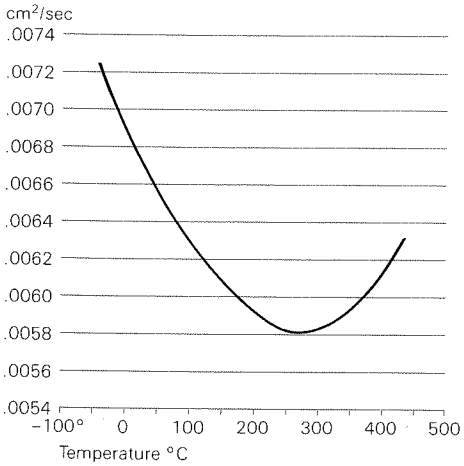
Specific Heat



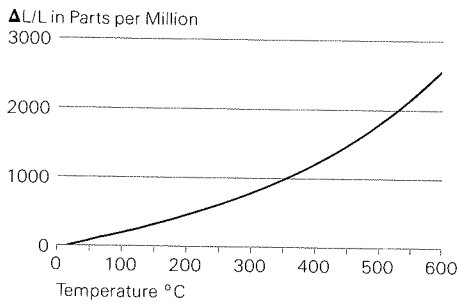
Thermal Conductivity



Thermal Diffusivity



Thermal Expansion



Thermal Shock Resistance

	Thickness	*°C*	*°F*
6″ x 6″ plates	1/8″	180	324
(annealed glass)	1/4″	150	270
	1/2″	100	180

These data are dependent on the geometry of the sample and must be considered approximations. Values are based on plunging samples into cold water after oven heating. Resistance of 100°C (180°F) means no breakage is expected if heated to 110°C (230°F) and plunged into water at 10°C (50°F). Tempered samples have approximately twice the resistance of annealed glass.

Heat Resistance

	Continuous Operating Temperature		*Maximum Intermittent Operating Temperature*	
	°C	*°F*	*°C*	*°F*
annealed	230	446	490	914
tempered	260	500	290	554

Thermal Stress Resistance

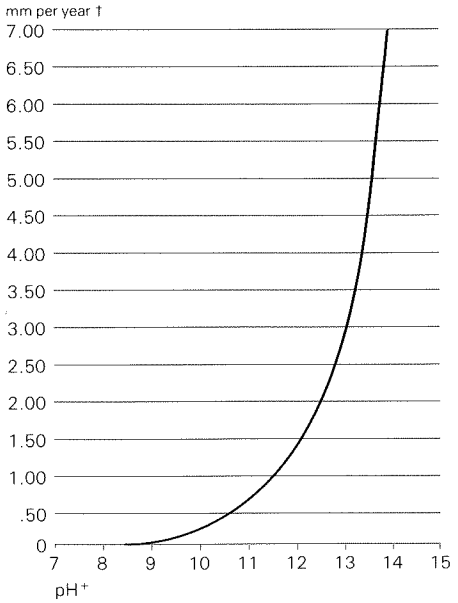
Thermal stress resistance in °C (°F) is the temperature differential between the two surfaces of a tube or a constrained plate of annealed glass that will cause a tensile stress of 0.7 kg/mm^2 (1000 psi) on the cooler surface. For PYREX® brand 7740 glass, this value is 54°C (97°F).

Chemical Durability

Representative Chemical Values

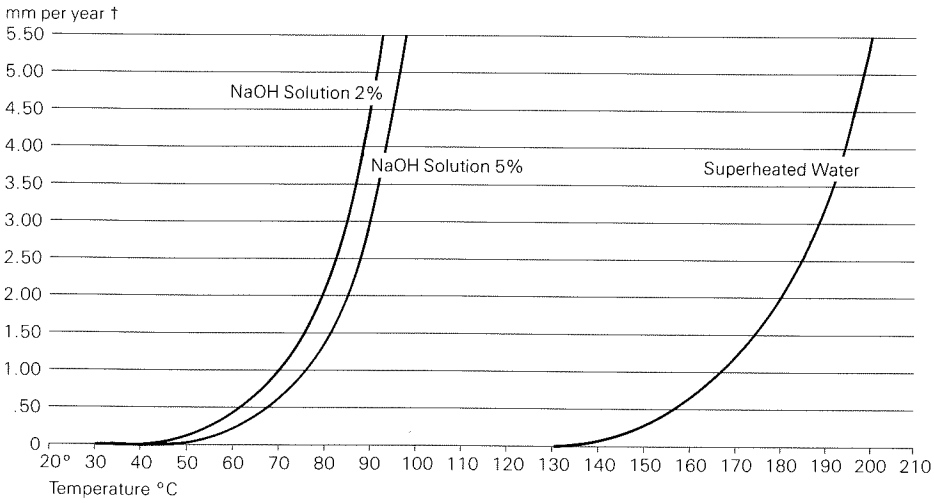
Reactant	*Temperature*	*Wt. Loss mg/cm^2*	*Wt. Loss lb/in^2*
5% HCL (24 hr.)	95°C (203°F)	0.0045	6.40×10^{-8}
N/50 Na_2CO_3 (6 hr.)	100°C (212°F)	0.12	1.71×10^{-6}
5% NaOH (6 hr.)	100°C (212°F)	1.4	1.99×10^{-5}

Depth of Attack vs pH$^+$



† Calculated from weight loss over a 24 hour period

Depth of Attack vs. Solution Temperature



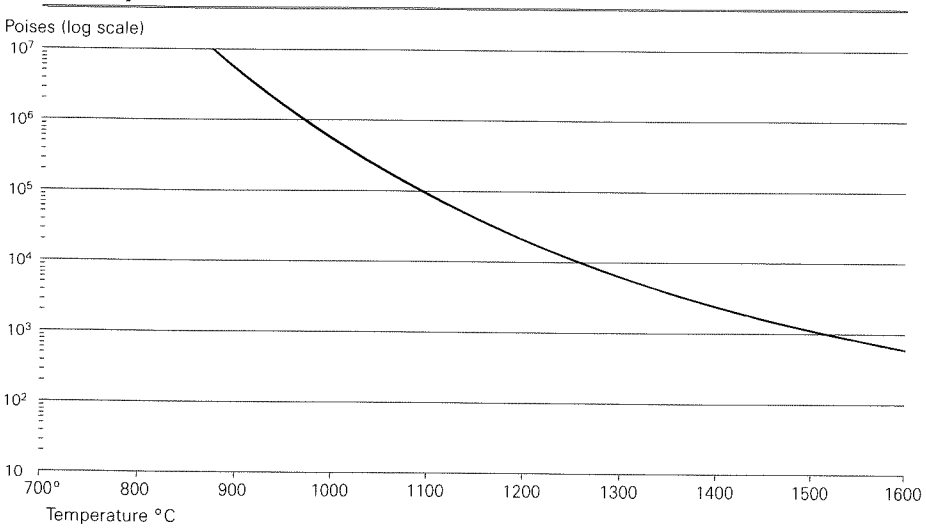
† Calculated from weight loss over a 24 hour period

Mechanical Properties

Representative Mechanical Values

Density, 25°C (77°F)	2.23 g/cm^3	139.2 lb/ft^3
Young's modulus, 25°C	6.1 x 10^{-3} kg/mm^2	9.1 x 10^6 psi
Shear modulus, 25°C	2.67 x 10^{-3} kg/mm^2	3.8 x 10^6 psi
Poisson's ratio, 25°C		0.20
Abrasion Resistance		3 times greater than window glass
Design Stress		
annealed		1000 psi
tempered		3000 psi
Knoop hardness, KHN_{100}		418

Viscosity

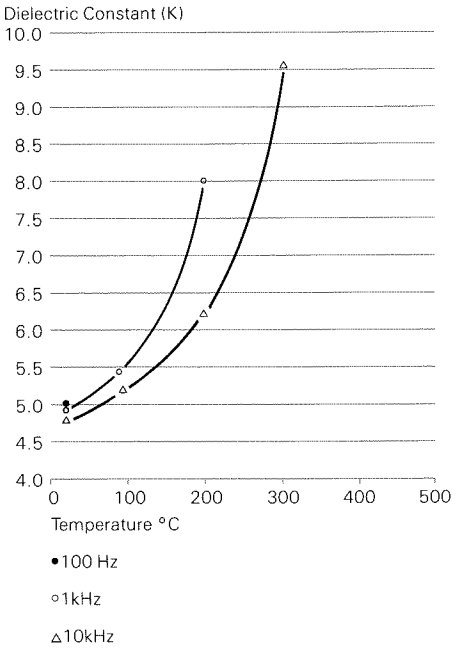


Electrical Properties

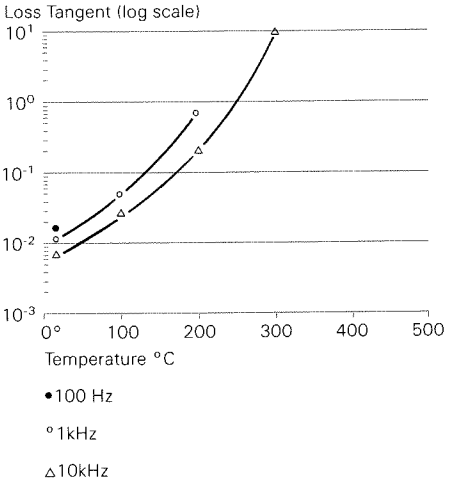
Representative Electrical Values

Dielectric constant	
1 MHz, 25°C (77°F)	4.6
8.6 KHz, 25°C	4.5
Loss tangent	
1 MHz, 25°C	.005
8.6 KHz, 25°C	.0008
Power Factor 1 MHz, 25°C	.0046
Volume Resistivity ohm-cm	
Log ρ at 250°C (482°F)	8.1
Log ρ at 350°C (662°F)	6.6

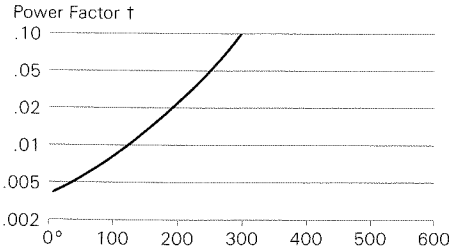
Dielectric Constant



Loss Tangent

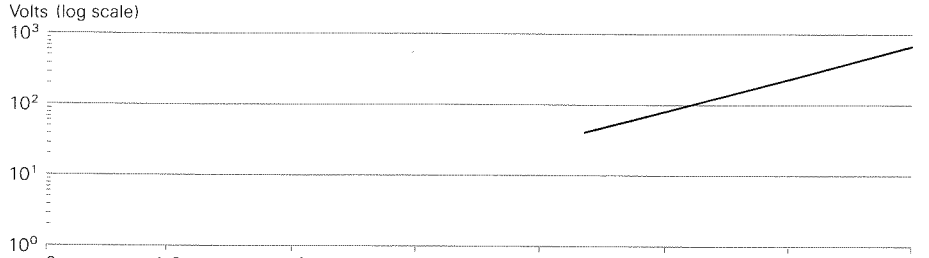


Power Factor

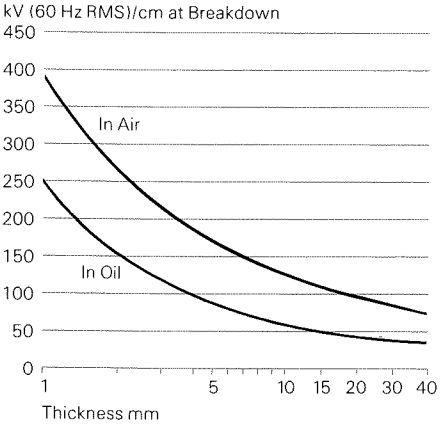


† Tangent of loss angle at 1 MHz

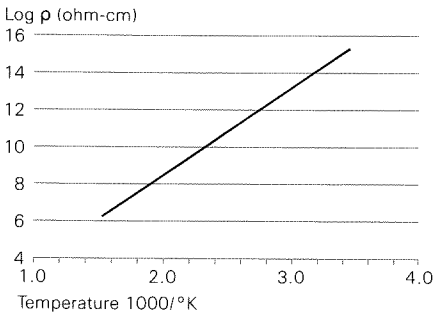
Dielectric Strength



Dielectric Breakdown vs. Glass Thickness



DC Resistivity



Test Values at 20°C Under Oil in Air
Normal Edge Effects Prevailing
Rate of Voltage Increase = 667 Volts RMS/sec.

Optical Properties

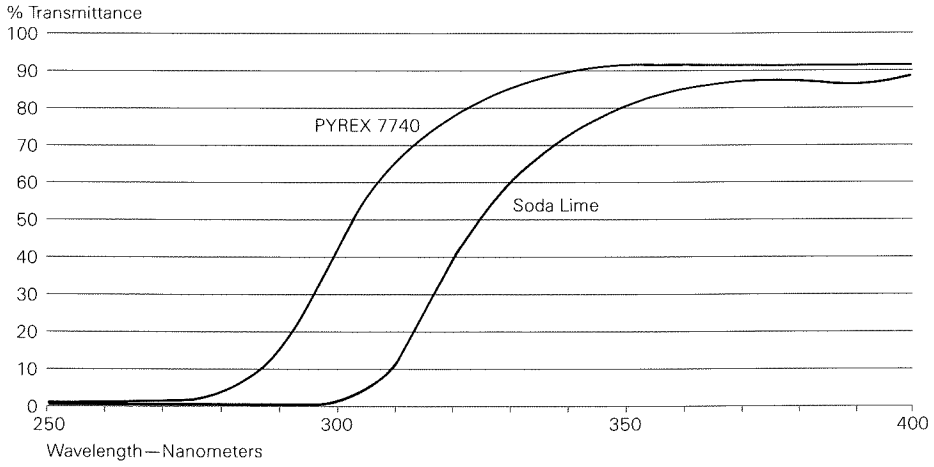
Representative Optical Properties

Refractive index	
N_F (486) (nm)	1.4776
N_D (589) (nm)	1.4727
N_C (656) (nm)	1.4705
Birefringence constant nm/cm/kg/mm^2	394

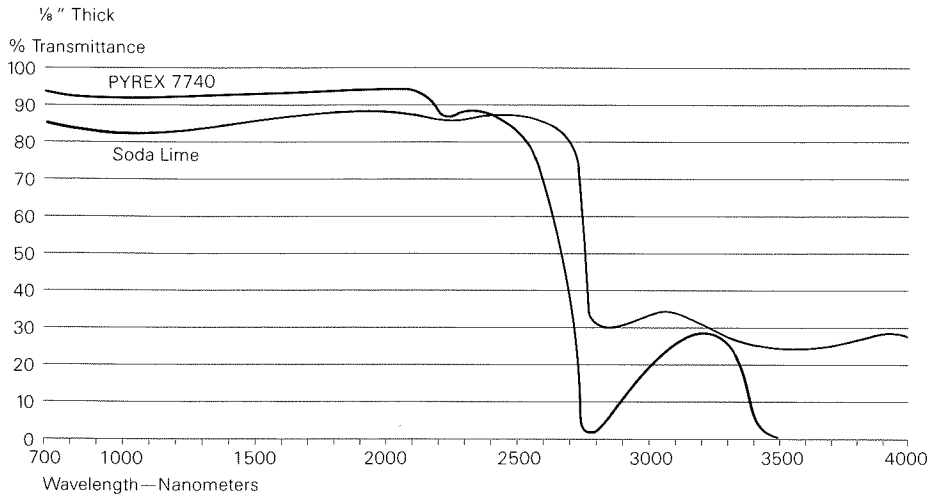
Resistance to Radiation Degradation

Due to its purity, PYREX® Code 7740 glass resists solarization and discoloration from exposure to electron, gamma, proton and neutron and solar radiation more effectively than higher expansion optical glasses.

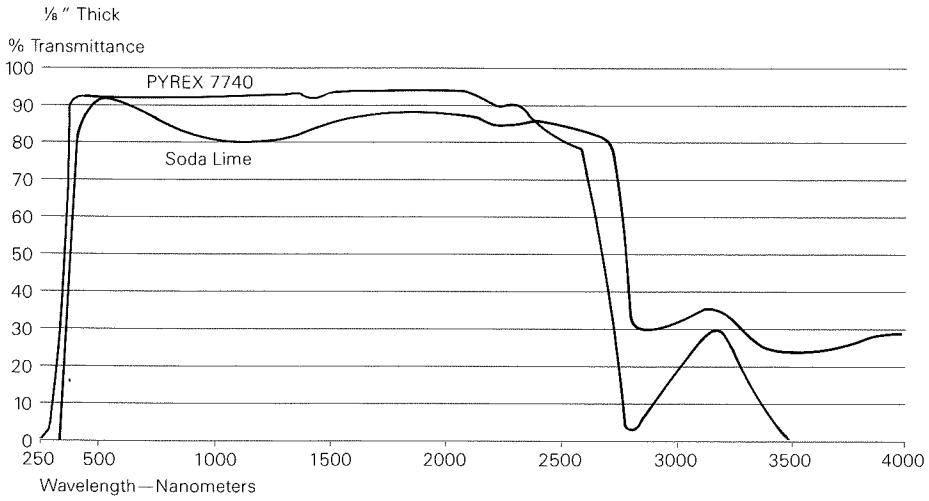
UV Transmittance— ⅛ In. Thickness



Infrared Transmittance



Full Spectrum Transmittance



Thickness-Transmittance Nomograph

The transmittance of polished 7740 glass for radiation of a given wavelength may be expressed by the relation

$$T = K \cdot 10^{-\beta t}$$

Where T is the transmittance
K is a factor dependent upon surface reflection*
β is an absorption coefficient
t is the thickness

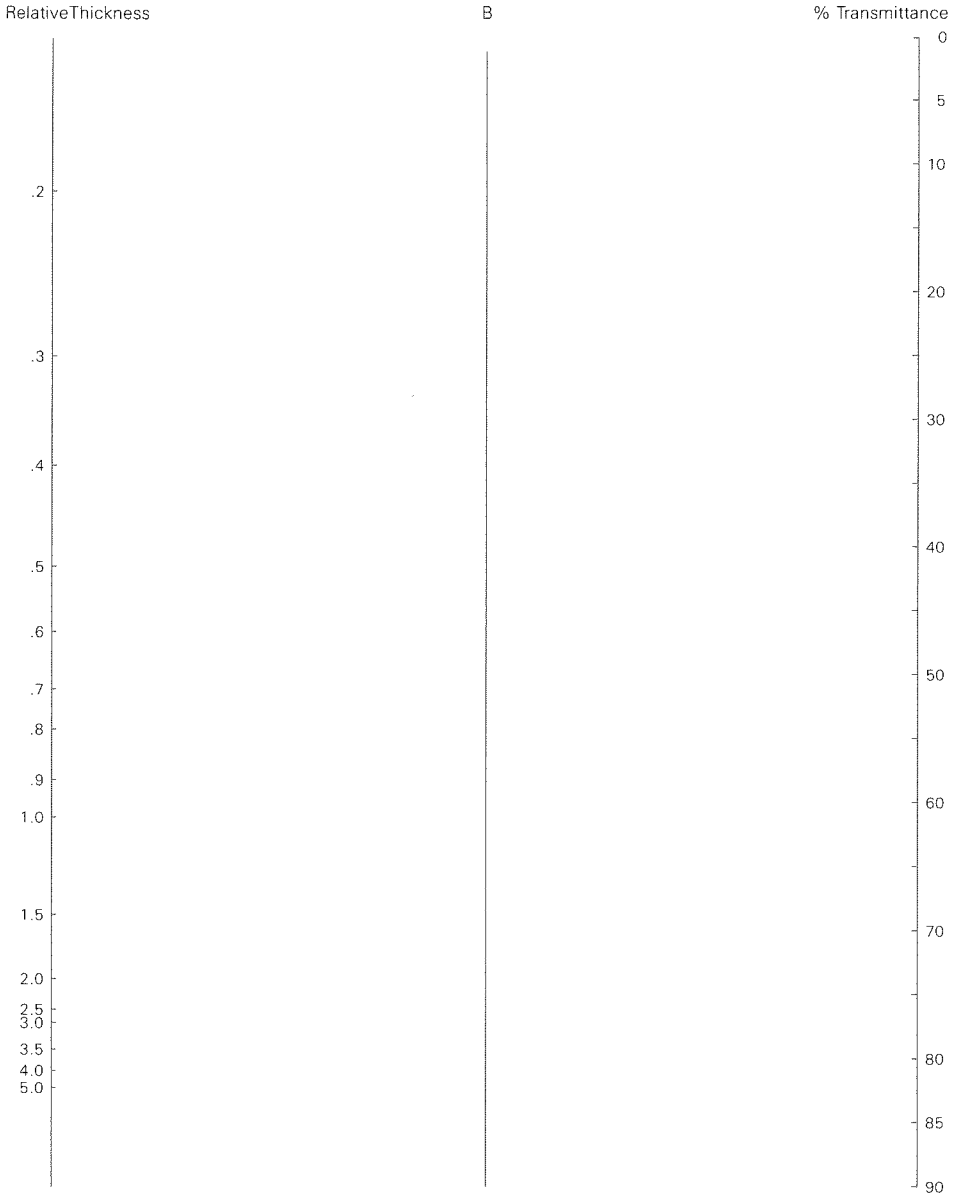
*This is in accordance with Lambert's law with a correction factor for surface reflection.

The accompanying nomograph represents this relation and can be used for the solution of thickness-transmittance problems. The transmittance values are to be used as percentages at a given wavelength. Total transmittance values cannot be determined from this nomograph. Thickness values may be used directly or as relative values (i.e., 3mm and 6mm can be considered as relative values of 1 and 2 units).

Directions

Place a straight edge on the chart connecting the known thickness with its percent transmittance on the transmittance scale. Place a pointer at the point of intersection of the straight edge with the line labeled B. Rotate the straight edge about the pointer to your required thickness or transmittance. Read the resulting transmittance or thickness at the point of intersection of the straight edge with the scale.

Thickness-Transmittance Nomograph



Other PYREX® Glass Products

Lenses, globes, clock domes, fresnels, and reflectors. PYREX® brand 7740 glass offers high transmission, heat resistance, thermal and impact strength for today's high intensity lighting.

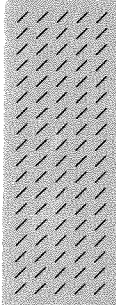
Services

At Corning, skilled engineers and designers work with you to develop component parts or complete products from glass. As with all Corning products, we offer the experience that comes with over a century of making glass more useful.

Special Finishing and Fabrication

Many of Corning's Industrial Supplies distributors are equipped to fabricate special shapes, drill holes, grind and polish, and cut tubing. For additional information, contact your local Corning Industrial Supplies distributor or:

Corning Glass Works
Industrial Supplies
MP 21-1-4
Corning, New York 14831
607•974•4231



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CORNING

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