VYCOR®

Glasses

Industrial Supplies

CORNING

Introduction

VYCOR® brand glass products perform better at high temperatures than other commercially-produced glass products.

Made of a 96% silica glass, VYCOR products offer a pre-shrunk, non-porous medium ideally suited for heat-resistant applications.

Through a proprietary process, Corning produces 96% silica glasses in tubing, rod, sheet, pressed, slip-cast and fabricated ware.

Basic Properties

VYCOR finished products are comparable to fused silica or quartz products in performance and properties.

Because of their high-temperature properties, VYCOR products can be used at continuous temperatures up to 900°C and at intermittent temperatures up to 1200°C.

Due to its extremely low coefficient of thermal expansion, 96% silica provides excellent thermal shock resistance. For example, flat glass ⅛" thick heated to 1200°C can be quenched in ice water without breaking.

VYCOR glassware performs better than other glassware in the presence of acids, water and steam at low and high temperatures. In the presence of alkalis, VYCOR glass products perform similarly to other commercially available glass products.

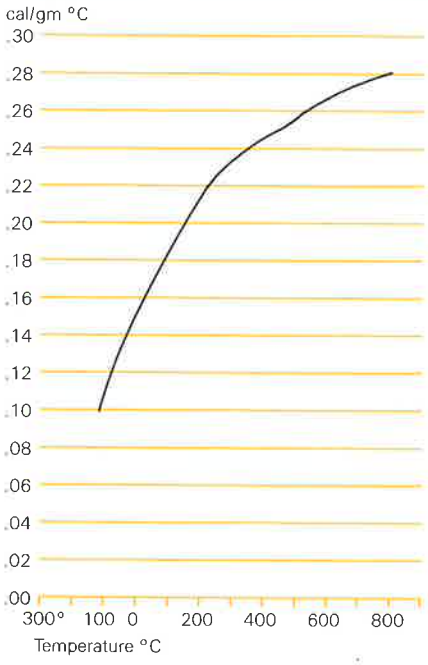
High electrical resistivity and low dielectric loss characterize Corning's 96% silica compositions. Glass Code 7913 transmits more than 90% of both ultraviolet (at 365 millimicrons) for 1.97mm thickness and infrared light (up to 2.4 microns) for 1.9mm thickness. Code 7950 (red VYCOR ware) blocks most visible light while transmitting infrared light. It is ideal for blocking visible glare from heating units.

Thermal Properties

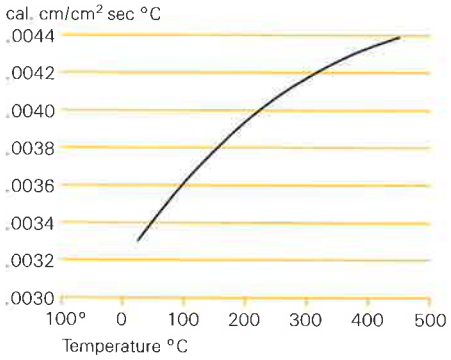
Representative Thermal Values *

Average thermal expansion coefficient 0–300°C, inch/inch/°C	7.5×10^{-7}
Continuous service use temperature	900°C (1652°F)
Intermittent service use temperature	1200°C (2192°F)
Specific heat at 25°C, cal/gm °C	0.18
Thermal diffusivity at 25°C, cm^2/sec.	0.009
Thermal conductivity at 25°C, cal. cm/cm^2 sec. °C	0.0033
Total normal emissivity at 100°C	0.87
Total hemispherical emissivity at 100°C	0.82

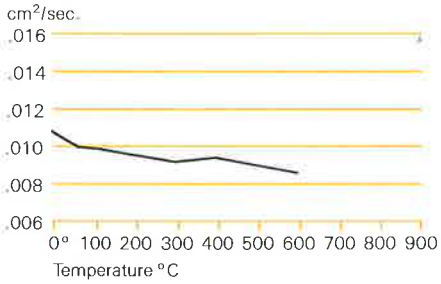
Specific Heat *



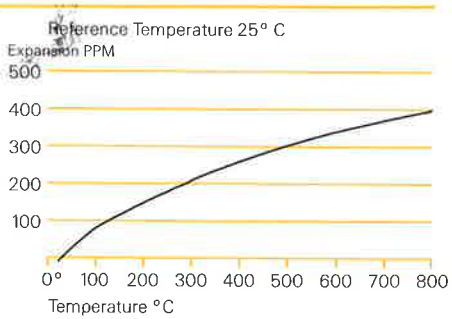
Thermal Conductivity *



Thermal Diffusivity *



Thermal Expansion *



*VYCOR Glass Code 7913

*Thermal Shock Resistance**

	Thickness	*°C*	*°F*
6″ x 6″ plates	⅛″	1200	2192
	¼″	1000	1832
	½″	750	1382
Thermal stress resistance		202	396

Chemical Durability*

Temperature	*Reactant*	*Wt. Loss mg/cm²*
95°C, 203°F	5% HCL (24 Hr.)	0.0005
100°C, 212°F	N/50 Na_2CO_3 (5 Hr.)	0.07
100°C, 212°F	5% $NaOH^2$ (6 Hr.)	0.90

Mechanical Properties*

Density at 25°C, gm/cm³	2.18
Young's Modulus at 25°C, kg/cm²	675,000
Shear Modulus at 25°C, kg/cm²	285,000
Poisson's Ratio at 25°C	0.19
Modulus of Rupture, Abraded Surface at 25°C, kg/cm²	492
Knoop Hardness, KHN_{100}	487
Abrasion Resistance	3 times greater than window glass

Electrical Properties*

Dielectric Constant	
1 MHz at 25°C	3.8
8.6 GHz at 25°C	3.8
Loss Tangent	
1 MHz at 25°C	0.0005
8.6 GHz at 25°C	0.0006
Electrical Resistivity, ohms/cm	
Log_{10} R at 250°C	9.7
Log_{10} R at 350°C	8.1
Power Factor	
At 1 MHz and 20°C	0.0004

Optical Properties

Resistance to Radiation Degradation *

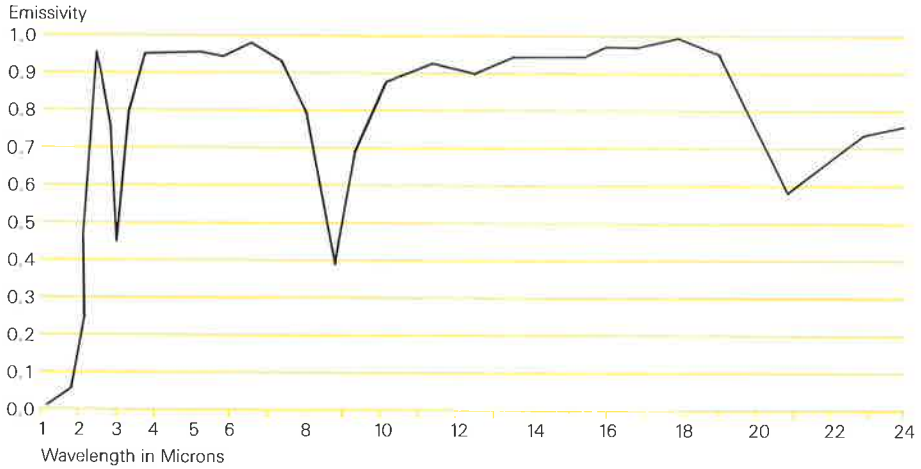
Due to its purity, Code 7913 glass resists discoloration from exposure to electron, gamma, proton, neutron, and solar radiation more than higher expansion optical glasses.

Fluorescence *

Shortwave ultraviolet rays produce a faint bluish fluorescence in all 96 percent silica optical glasses.

Spectral Emissivity *

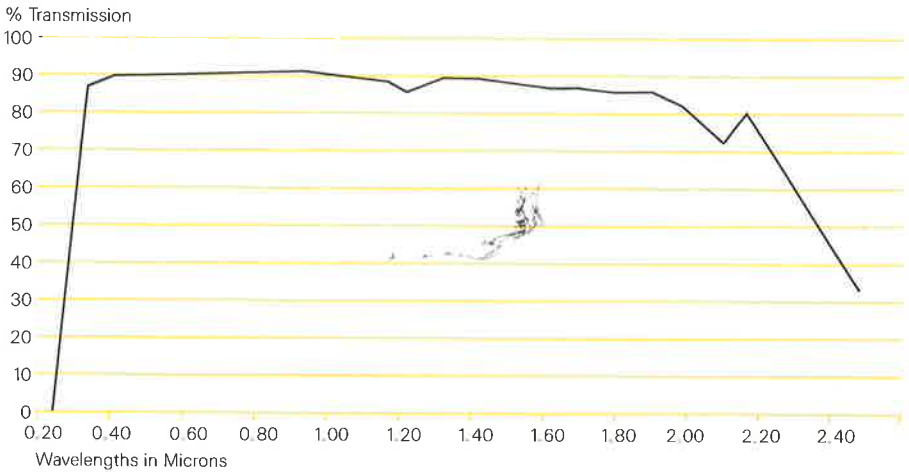
(¼" Thick)



Computed from room temperature measurements of transmittance and reflectance.

Transmission Curve *

(¼" Thick)



*VYCOR Glass Code 7913

VYCOR® Glass Products

VYCOR® glass products are manufactured in a variety of shapes, sizes and textures—from polished plate glass for sight windows to slipcast products for intricate shapes.

Due to its low thermal expansion, a VYCOR glass product *cannot* be tempered; therefore, it is available only in an annealed state.

VYCOR® Tubing and Rod

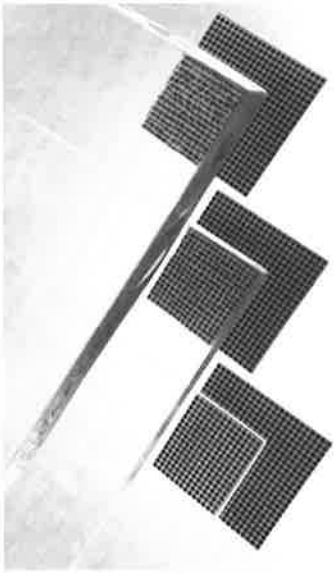
Many industrial components use Code 7913 glass tubing and rod for high-temperature applications.

Tube components include gas samplers and sheaths for thermocouples, electrical immersion heaters, space heaters, defroster tubes and toaster oven heaters. Rods provide low thermal expansion and resist abrasion for uses such as thermostat reference bars.

Corning's 96% silica glasses can be sealed directly to fused silica. For sealing VYCOR tubing to glasses of higher expansion, Corning can supply one-piece graded seals.

VYCOR tubing is available up to 4.5" OD with a minimum wall of .080". Tubing with an ID as small as .005" is also possible. Precision bore tubing, ID from .040" to 1", is made to a bore tolerance of ± .002". Stock lengths are 24" with tubing lengths up to 60" available.

VYCOR rod is available to ⅝" maximum diameter. Maximum length is 60".



VYCOR Flat Glass

Of all flat glass products, Code 7913 is most resistant to continuous heat, chemical attack and thermal shock. The glass is used widely for heat-stressed windows and firing plates.

Polished plate glass offers a smooth surface superior to common window glass. The wavy surface of rolled glass offers a lower cost alternative to polished plate glass in windows where optimum visibility is not critical.

Polished and rolled flat glass is available in stock sheets 12¼" x 12¼" maximum dimensions. Rectangles up to 13" x 18" are available as special orders. Glass thicknesses for polished flat glass include ⅛", 3⁄16, ¼", 5⁄16",⅜" and ½". Rolled finish flat glass is available in ⅛", ¼", ⅜", ½" and ⅝" thicknesses.

Edges on rectangles can be *ground* to a full dimensional tolerance of ± 1⁄32" or *cut and swiped* to a full dimensional tolerance of ± 1⁄16".

Maximum diameter for circular pieces is 12". On circles up to 8" diameter, edges are ground to a tolerance of ± 1⁄64"; over 8" diameter, edges are ground to ± 1⁄32".

VYCOR® Sight Glass

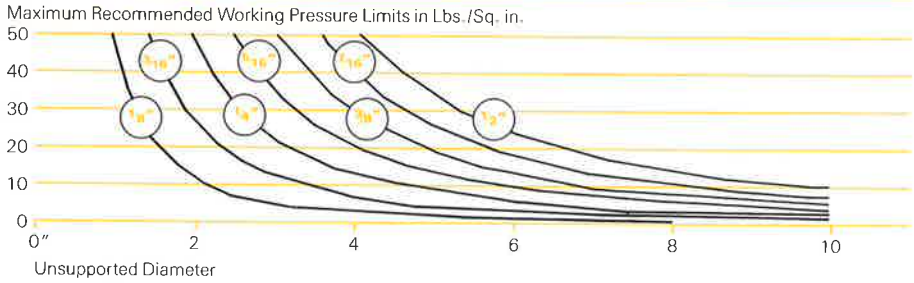
Corning's Code 7913 sight glasses are used in many high temperature chemical and industrial processes. Ground and polished sight glasses are custom cut to your dimensional specifications. Available glass thicknesses include ⅛", 3/16", ¼", 5/16", ⅜" and ½".

Precision-made sight glasses require proper maintenance against breakage and chemical corrosion. For details see "Use and Care, Sight Glasses."

Recommended Minimum Thickness

Recommended minimum thickness for VYCOR ground and polished sight glasses.*

(0-50 psi)



(50-400 psi)

Allow gasket to extend beyond unsupported diameter.

NOTE: Recommended working pressures in this chart are not applicable for annular edge sight glass. For information on annular edge sight glass, see the brochure describing PYREX® glass products.

Other VYCOR® Glass Products

VYCOR "thirsty" glass (Code 7930) absorbs moisture through interconnecting pores averaging four millimicrons in diameter. The average internal surface area is 250 m^2/gram. Available as tubing, rod, sheet and pressed ware.

Red VYCOR brand glass (Code 7950) glass absorbs most visible light from a tungsten filament (2700°K) but effectively transmits infrared. Available as tubing, sheet and pressed ware. VYCOR brand glass can be produced in colors other than red.

VYCOR ground and screened glasses contain properties valued in dental compounds and plastic fillers. Available in particle sizes to a 325 mesh minimum.

VYCOR slipcast products are sintered glass products for intricately designed parts used in high-temperature applications.

VYCOR graded seals are used to seal higher expansion glass to lower expansion materials such as fused silica. The coefficient of thermal expansion changes continuously along the length of the tubing. The diameter is constant from one end of the seal to the other.

Services

At Corning, skilled engineers and designers work with you to develop component parts or complete products from 96% silica 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 distributors of Corning's glasses are equipped to handle special cut and finish work not shown in this brochure. For additional information and quotations on special requirements, contact your regional distributor of VYCOR® glass products or:

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