- DURAN® properties

Very high chemical resistance

DURAN® borosilicate glass is highly resistant to water, neutral and acid solutions, concentrated acids and acid mixtures, and to chlorine, bromine, iodine and organic substances. Its chemical resistance is superior to that of most metals and other materials, even during prolonged periods of exposure and at temperatures above 100 °C.
Only hydrofluoric acid, concentrated phosphoric acid and strong alkali cause appreciable surface removal of the glass (glass corrosion) at elevated temperatures (>100 °C).

Chemical composition

DURAN® has the following approximate composition (%):

SiO_2	B_2O_3	$Na_2O + K_2O$	AI_2O_3
81	13	4	2

Chemical resistance

Hydrolytic resistance class (DIN ISO 719)	class 1
Acid class (DIN 12 116)	class 1
Alkali class (DIN ISO 695)	class 2

Due to its good hydrolytic resistance, DURAN® meets the requirements of the USP, EP and JP and is a neutral glass that corresponds to glass type 1. It can therefore be used in an almost unrestricted way in pharmaceutical applications and in contact with foodstuffs.

Inert behavior

Due to the inert behavior of DURAN® there is no contact or interaction (e. g. ion exchange) between medium and glass, which avoids interfering effects.

High usage temperature

The maximum permissible operating temperature for DURAN® is 500 °C. Above a temperature of 525 °C the glass begins to soften and above a temperature of 860 °C it changes to the liquid state.

DURAN® can be cooled down to the maximum possible negative temperature and is therefore suitable for use with liquid nitrogen (approx. – 196 °C). During such use/ freezing. In general DURAN® products are recommended for use down to – 70 °C. During thawing ensure that the temperature difference does not exceed 100 K.

DURAN® glassware is suitable for use in microwaves.

Minimal thermal expansion & high resistance to thermal shock

As it has a very low coefficient of linear expansion (3.3 x 10^{-6} K^{-1}), a feature of DURAN® is its high thermal shock resistance up to $\Delta T = 100$ K.

Physical data

Coefficient of mean linear thermal expansion α (20 °C; 300 °C) acc. to DIN ISO 7991	3.3 x 10^{-6} K^{-1}
Transformation temperature T_g	525 °C
Temperature of the Glass at viscosity η in dPa x s: 10^{13} (annealing point)	560 °C
$10^{7.6}$ (softening point)	825 °C
10^4 (working point)	1260 °C
Maximum short-time working temperature	500 °C
Density ρ at 25 °C	2,23 g x cm^{-3}
Modulus of elasticity E (Young´s modulus)	64 x 103N x mm^{-2}
Poisson´s ratio μ	0,20
Thermal conductivity λw at 90 °C	1,2 W x m^{-1} x K^{-1}
Temperature for the specific electrical resistance of 10^8 Ω x cm (DIN 52 326) t_k 100	250 °C
Logarithm of the electrical volume resistance (Ω x cm)	at 250 °C 8/at 350 °C 6,5
Dielectrical properties (I MHz, 25 °C) Dieletric constant ε	4,6
Dielectric loss factor tan δ	37 x 10^{-4}
Refractive index(λ = 587.6 nm) nd	1,473
Stress-optical coefficient (DIN 52 314) K	4,0 x 10^{-6} mm^2 x N^{-1}

Optical properties

In the spectral range from about 310 to 2200 nm the absorption of DURAN® is negligibly low. It is clear and colourless. Fairly large layer thicknesses (axial view through pipes) appear slightly yellow/greenish.

Reference: http://www.duran-group.com/en/about-duran/duran-properties.html