

Quartz Glass

Tubes and Rods

PH 300, GE 214, QI PN

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General Information

The chemical composition of quartz glass is the simplest mesh among all glasses.

Due to its specific physical and chemical properties, quartz glass, which is melted from pure silicon dioxide (SiO_2), is used for the following applications:

- ◆ For high temperature processes quartz glass is recommended due to its high temperature resistance.
- ◆ Due to the high pureness of this material, components and systems made of quartz glass are used in the semi conductor and lamp industry.
- ◆ In the illuminate production quartz glass is regarded as key material due to its very good transparency in the ultraviolet, visible and infrared wavelengths and its high temperature resistance.
- ◆ In the electronics and electro-techniques quartz glass is used due to its low electric conductance and its low dielectric leakage.
- ◆ In the field of plant construction and tool building, quartz glass is widely used due to its high resistance against saline solutions, acids and water. Besides hydrofluoric acid and hot phosphoric acid, quartz glass is not corroded by any acid and acts neutrally against many other substances.

Chemical Reaction and Chemical Properties of Quartz Glass

Quartz glass is extraordinarily resistant against water, saline solutions and acids.

In opposite to ordinary glass, quartz glass is not hygroscopic. It is only corroded by hydrofluoric acids. Besides alkali and alkaline earth metals, oxide free metals do not react with quartz glass. Therefore, they can be distilled and melted in quartz glass containers.

Quartz glass is sensitive against all alkali and alkaline earth compositions. Even traces of these compositions accelerate defects at high temperatures.

Reaction of different elements and compositions against quartz glass:

Groups	Elements Compositions	Effects	Remarks
Metals/Non-Metals	Ag	no reaction	
	AL	conditional reaction	starting app. 700 °C quick reaction
	Au	no reaction	
	Br	no reaction	
	C	conditional reaction	starting app. 1500 °C
	Ca	conditional reaction	starting app. 600 °C
	Cd	no reaction	
	Ce	conditional reaction	starting app. 800 °C
	Cl	no reaction	
	F	strong reaction	only in humid conditions
	Hg	no reaction	
	J	no reaction	
	Li	strong reaction	starting app. 200 °C
	Mg	conditional reaction	starting app. 700 °C
	Mn	no reaction	
	Mo	no reaction	
	Na	conditional reaction	reacts only as vapour
	P	strong reaction	
	Pb	no reaction	
	Pt	no reaction	
	S	conditional reaction	starting 1000 °C low reaction
	Si	conditional reaction	
	Ca	no reaction	
Cd	no reaction		
Ce	no reaction		
Cl	no reaction		
Oxides	F	conditional reaction	starting app. 1200 °C
	Hg	conditional reaction	starting app. 900 °C
	J	conditional reaction	starting app. 1000 °C
	Li	conditional reaction	starting app. 950 °C
	Mg	conditional reaction	starting app. 950 °C
	Mn	conditional reaction	starting app. 950 °C
	Mo	conditional reaction	
	Na	conditional reaction	starting app. 800 °C
P	conditional reaction	starting app. 800 °C accelerated defects	
Acids	Pb	no reaction	
	HNO ₃	no reaction	
	HCL	no reaction	
	HF	strong reaction	lower than for other glasses
	H ₃ PO ₄	strong reaction	lower than for other glasses
Gasses and Vapours	HCL	no reaction	

Groups	Elements Compositions	Effects	Remarks
	H ₂ /N ₂ /O ₂	no reaction	
	NO ₂ /SO ₂	no reaction	
	CO	no reaction	
Salts	BaCl ₂	conditional reaction	
	BaSO ₄	conditional reaction	starting app. 700 °C
	Borate	conditional reaction	
	BCl ₃	conditional reaction	starting app. 900 °C
	KCL	conditional reaction	accelerated defects
	KF	conditional reaction	
	NaCl	conditional reaction	
	Na-Metaphosphat	strong reaction	
	Na-Polyphosphat	strong reaction	
	Na ₂ SO ₄	no reaction	
	Na-Wolframmat	strong reaction	accelerated defects
	Nitrate	conditional reaction	
	ZnCl ₂	conditional reaction	
	Zn-Phosphat	conditional reaction	at app. 300 °C low, than increasing
	Zn-Silikat	conditional reaction	starting app. 1000 °C

The pureness of quartz glass is extraordinarily high. An exact analysis of trace elements is very difficult. The analysis results often are close to the limit of verifiability. Minor spread of values is caused by fluctuations in the pureness of the initial material.

- ◆ Hydrolysis class 1 acc. DIN 12111
- ◆ Acid class 1 acc. DIN 12116
- ◆ Base class 1 acc. DIN 52322

Physical Data of Quartz Glass

Description	Value	Unit
<u>Mechanical Properties</u>		
density (20 °C)	2,2	g/cm ³
tensile strength	50	N/mm ²
pressure resistance	1150	N/mm ²
elasticity modulus	7,3 x 10 ⁴	N/mm ²
torsion modulus	3,1	N/mm ²
modulus of rupture	68	N/mm ²
Poisson ration	0,17	
Mohn-hardness	5,5 – 6,5	
micro hardness	8600 – 9800	N/mm ²
Knoop hardness	5800 – 61	N/mm ²
sonic speed of longitudinal wave	5720	m/s
ultra sound velocity at 50 °C	5960	m/s
<u>Thermal Properties</u>		
coefficient of expansion (0 – 300 °C)	0,58 x 10 ⁻⁶	K ⁻¹
lower limit for tension release (14,5 dPas)	1160	°C
upper limit for tension release (13,0 dPas)	1260	°C
refractory deformation temperature (7,6 dPas)	1760	°C
processing range (5 – 8 dPas)	1700 – 2100	°C

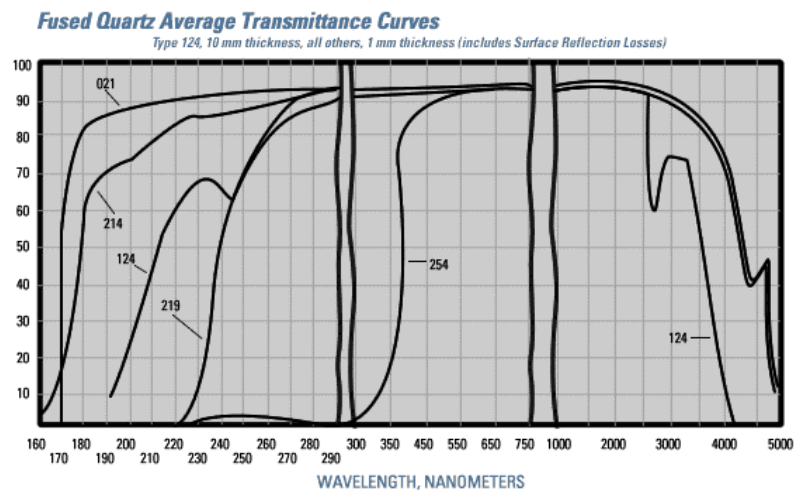
maximum duration of permanent processing temperature	1100	°C
maximum duration of short-time processing temperature	1300	°C
medium specific heat (0 – 100 °C)	770	J/kg K
heat conductivity (100 °C)	1,47	W/K m
gas permeability for helium (300 °C)	$2,36 \cdot 10^{-10}$	$\text{cm}^3 \text{ mm/s cm}^2 \text{ mbar}$
gas permeability for hydrogen (300 °C)	$0,074 \cdot 10^{-10}$	$\text{cm}^3 \text{ mm/s cm}^2$
Electric Properties		
specific electric resistance (20°C)	10^{18}	$\Omega \text{ cm}$
dielectric constant (20 °C und 10^6 Hz)	3,7	
Durchschlagsfeldstärke (20 °C)	250 – 400	KV/cm
dielectric loss factor (1 kHz)	$<5 \cdot 10^{-4}$	

Optical Properties of Quartz glass

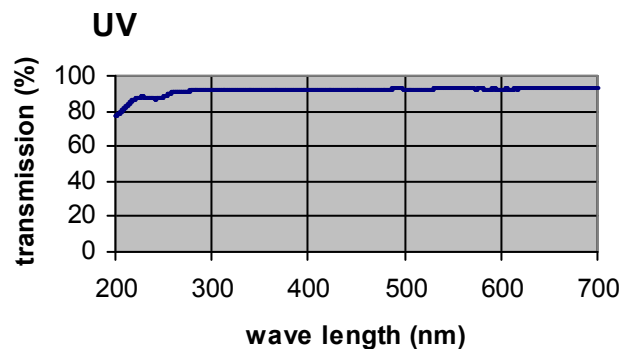
Refraction index at 587,56 nm is 1,459

In opposite to silicate glasses, quartz glass offers a very good permeability for all wavelength areas.

GE 214

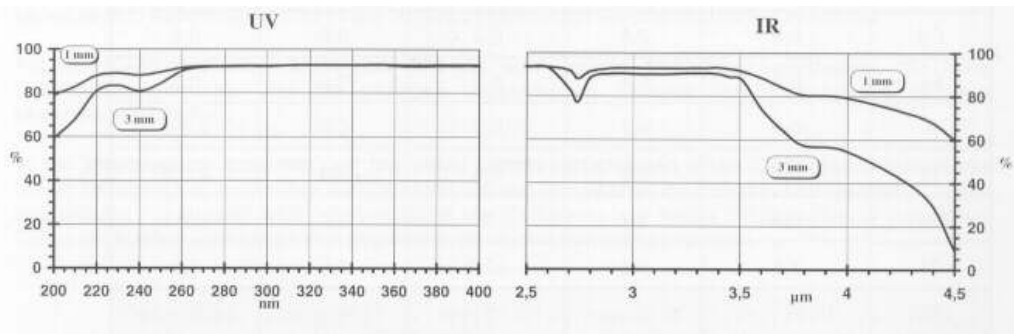


PH 300



Wavelength (nm)	185	195	205	215	225	235	245	260	270	280	290	300	320	340	360	380
Transmittance (%)	69,2	76,8	78,8	84,5	87,9	87,5	87,0	90,6	91,4	91,5	91,7	91,8	92,0	92,0	92,2	92,5

QI PN



Traces contamination of Quartz Glass and OH Content in ppm

The contaminations in quartz glass are very low. The table shows the largest and most important contaminations.

Glass	Al	Ca	Cu	Fe	K	Li	Mg	Na	Ti	Zr	OH
GE 214	14	0,35		0,2	0,5	0,5		0,6			<15
PH 300		0,8	0,05	0,3	1,6	1,4	0,1	1,6			<10
QI PN	16	0,8		0,3	0,9	0,7		0,9	0,9	1,5	25±10

Treatment and Cleaning of Quartz Glass

A thorough and appropriate cleaning and treatment of quartz glass products is essential to maintain the properties. The following recommendations should be noticed:

Recommendations for cleaning:

- ◆ Do not clean parts of quartz glass with non-alkali detergents.
- ◆ Contaminations with fat can be removed with alcohol.
- ◆ Acids in 5 % hydrofluoric acids for 2-3 minutes.
- ◆ Subsequent cleaning in distilled or deionised water.
- ◆ After cleaning, touch the quartz glass only with clean gloves.
- ◆ If possible, process quartz glass only after cleaning or pack it carefully.

Quartz glass should always be touched only with gloves. You should also take care that the rooms, tools and machines meet high cleanness demands.

Products/Delivery Possibilities

- ◆ Quartz glass - tubes
- ◆ Quartz glass - rods
- ◆ Translucent quartz - tubes for infrared rays
- ◆ Doubt quartz glass tubes to avoid ozone formation and for UV-reduction

For available measurements please see our price list.

Customer specific cuttings upon request.

Technical Terms of Delivery for Quartz Glass

The value lists in the tables refer to industrial scratch and broken standard lengths.

Saw cut lengths upon request.

Tubes:

A-Ø mm	A-Ø ± %	Ovality ≤ %	Wall thickness ± %	Eccentricity ≤ %	Length ± mm	Deflection ≤ mm/m
≤5	2,0	2,0	8	10	10	2
>5 ≤30	1,5	1,5	8	10	10	2
>30 ≤40	2,0	1,5	10	12	10	2
>40 ≤50	3,0	2,0	10	12	10	2
>50 ≤55	4,0	2,0	10	12	10	2

Rods:

A-Ø mm	A-Ø ± %	Ovality ≤ %	Length ± mm	Deflection ≤ mm/m
>2 ≤5	6	2	10	2
>5 ≤20	3	2	10	2

Standard length 1500 mm.

Further dimensions upon request.

Do you have any questions regarding our products or do you wish an individual consultation concerning quartz glass? Just send us an email with your request.

We would be happy to support your development with our know-how.

Let's talk about it!

