

Vitreosil 055 Technical Data

Refractive Index & Temperature Coefficient

(typical values)

	Wavelength (nm)	Refractive Index (n)	Temperature Coefficient dn/DT(ppm/K)
	1128.95	1.4489	9.6
	1064.00	1.4496	9.6
	1060.00	1.4497	9.6
n_t	1013.98	1.4502	9.6
n_s	852.11	1.4525	9.7
n_r	706.52	1.4551	9.9
n_c	656.27	1.4564	9.9
n_c^2	643.85	1.4567	10.0
n_{He-Ne}	632.80	1.4570	10.0
n_D	589.29	1.4584	10.1
n_d	587.56	1.4585	10.1
n_e	546.07	1.4601	10.2
n_F^2	486.13	1.4631	10.4
n_g	435.83	1.4667	10.6
n_h	404.66	1.4696	10.8
n_i	365.01	1.4745	11.2
	334.24	1.4797	11.6
	312.66	1.4845	12.0
	253.73	1.5055	13.9
n_{KrF}	248.30	1.5084	14.2
	248.00	1.5086	14.2
	228.87	1.5211	15.5
	214.51	1.5337	17.0
	206.27	1.5426	18.1
	194.23	1.5588	20.3
n_{ArF}	193.40	1.5601	20.5
	193.00	1.5608	20.6
	184.95	1.5750	22.7

Temperature Limits

1050°C	For normal use
1350°C	For short periods
1350°C	For extended periods if temperature is not permitted to fall below 850°C
1650°C	For quick immersion applications

Chemical Reactivity

General	Inert to most elements and compounds
Acids	No reaction with acids at any temperature except phosphoric which reacts at 200°C and hydrofluoric which reacts at all temperatures
Caustic alkalis / some metallic oxides	Slow reaction at normal temperatures, however the rate of reaction increases with increase in temperature

The temperatures shown in this table are those at which significant reaction occurs

Metal	Temperature	Acid	Temperature	Oxide	Temperature
Ag	*	H ₂ SO ₄	*	Al ₂ O ₃	1000°C
Al	800°C	HNO ₃	*	BaO	900°C
Au	*	HCl	*	CaO	900°C
C	1000°C			CuO	800°C
Ca	600°C	HF	Readily at all temperatures	Fe (Oxides)	900°C
Cd	*			MgO	900°C
Ce	800°C	H ₃ PO ₄	200°C	PbO	800°C
Hg	*	Organic	*	ZnO	900°C
Li	250°C			Basic Oxides	800°C
Mg	800°C				
Mo	*				
Pb	*	Br ₂ , Cl ₂ , I ₂ , S	*		
Pt	*	F ₂	**		
Sn	*	HCl, SO ₂	*		
W	*	NO ₂ , H ₂	*		
Zn	*	N ₂ , O ₂	*		

* No significant reaction

** No reaction when dry (reacts as HF if wet)

Mechanical Data

(typical values)

Property	Units	Value
Density	g/cm ³	2.2
Modulus of elasticity (Young's modulus)	Gpa	73
Poisson's ratio		0.17
Bending strength	MPa	50
Shear modulus	GPa	31
Compressive strength	GPa	1.1
Acoustic Velocity		
Compressive	m/s	57 x 10 ²
Shear modulus	m/s	37 x 10 ²
Hardness		
Mohs Scale		7
Knoop Scale		820
Vickers DPH	Kg/m ²	1050-1350

Electrical Data

(typical Values)

Resistivity	°C	Ohm cm
	20	75 x 10 ²¹
	200	12 x 10 ¹⁴
	400	21 x 10 ¹⁰
	800	23 x 10 ⁶
Dielectric Constant		
0 Hz – 25 x 10 ⁹ Hz		3.78
Dielectric Loss Angle	Hz	tan δ
	10 ²	8.5 x 10 ⁻⁴
	10 ³	7.5 x 10 ⁻⁴
	10 ⁴	6.0 x 10 ⁻⁴
	10 ⁵	4.0 x 10 ⁻⁴
	10 ⁶	2.0 x 10 ⁻⁴
	10 ⁷	1.0 x 10 ⁻⁴
	10 ⁸	1.0 x 10 ⁻⁴
	10 ⁹	0.6 x 10 ⁻⁴
	10 ¹⁰	1.0 x 10 ⁻⁴

OPTICAL PROPERTY	Unit	VITREOSIL 055 (Diameter <100mm)	VITREOSIL 055 (Diameter 100-300mm)
Striae in direction of view	-	B	B
Granularity	-	faint	faint
Include defect (>0.1mm dia.)			
(a) total obstructed cross section	mm ² per 100cm ³	1	1
(b) maximum number	per 10cm ³	5	5
(c) maximum diameter	mm	0.5	1
Residual Birefringence	nm per mm path	<1	<1.5
Index of homogeneity			

Fluorescence

VITREOSIL fluoresces at 294nm and 397nm, typical of fused natural quartz.

Mechanical

Density	$2.2 \times 10^3 \text{ kg/m}^3$
Young's modulus	$73 \times 10^9 \text{ N/m}^2$
Rigidity modulus	$31 \times 10^9 \text{ N/m}^2$
Compressive strength	$2.0 \times 10^9 \text{ N/m}^2$
Tensile strength	$55 \times 10^6 \text{ N/m}^2$
Shear strength	$55 \times 10^6 \text{ N/m}^2$

Thermal

Coefficient of expansion 0.54×10^{-6} per degree C.

Chemical

Vitreous silica is inert to acids, except hydrofluoric and, at high temperatures, phosphoric. There is a slow reaction with caustic alkalis at normal temperatures. There is no reaction with water and steam at moderate temperatures and pressures.

Refractive index values at 20°C

Wavelength (nm)	Refractive index	Wavelength (nm)	Refractive index
200	1.551	633	1.457
248	1.509	700	1.455
254	1.504	800	1.453
300	1.488	900	1.452
400	1.470	1000	1.450
500	1.462	2000	1.438
589	1.458	3000	1.419

Polishing specification

Where the ration of diameter to thickness (or diagonal to thickness for plate) does not exceed 20:1 the standard specification is:

Parallelism	5 minutes of arc
Flatness	1 wavelength per cm at 589nm
Scratch and Dig	DIN3140 5/2 x 0.25 per 25 cm ²

Where the ratio exceeds 20:1 the same specification applies except that the flatness cannot be guaranteed.