Glass Viscosity and Working Temperatures (Vogel–Fulcher–Tammann)

Viscosity of a glass at a temperature from VFT constants, and the temperatures of its working, softening, annealing and strain points.

Method: Vogel–Fulcher–Tammann equation

Input parameters

Unit system: SI

Parameter	Value	Unit
VFT constant A ($\log_{10}$ Pa·s)	-2.6000	
VFT constant B	4,500.0	K
VFT temperature T_0	266.85	°C
Temperature	1,000.0	°C

Calculated results

Parameter	Value	Unit
Log viscosity (Pa·s)	3.5379	
Viscosity	3,450.6	Pa·s
Working point (10^3 Pa·s)	1,070.4	°C
Softening point (10^6.6 Pa·s)	755.98	°C
Annealing point (10^{12} Pa·s)	575.07	°C
Strain point (10^13.5 Pa·s)	546.35	°C

Notes for this case

• Vogel–Fulcher–Tammann: $\log_{10}\eta = A + B/(T - T_0)$. Fit A, B and T_0 to three measured viscosities. Reference points: working 10^3 Pa·s (forming), softening 10^6.6 Pa·s (sags under its own weight), annealing 10^{12} Pa·s (stresses relieve in minutes), strain 10^13.5 Pa·s (below it, no stress relief in practical times). Defaults roughly represent a soda-lime glass.

Formula and method

$$\log_{10}\eta = A + \frac{B}{T - T_0}, \quad T(\eta) = T_0 + \frac{B}{\log_{10}\eta - A}$$

Variables

A	VFT constant A ($\log_{10}$ Pa·s)	-
B	VFT constant B	K
T_0	VFT temperature T_0	K
T	Temperature	K
$\log_{10}\eta$	Log viscosity (Pa·s)	-
η	Viscosity	Pa·s
T_{work}	Working point (10^3 Pa·s)	K
T_{soft}	Softening point (10^6.6 Pa·s)	K
T_{anneal}	Annealing point (10^{12} Pa·s)	K
T_{strain}	Strain point (10^13.5 Pa·s)	K

Method and standards

Glass viscosity.

Assumptions and limits

- VFT fitted over the range of interest.

References

Vogel–Fulcher–Tammann equation

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/materials/properties/glass-viscosity-vft

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Reopens the calculator with the inputs of this report.