Capillary (Ostwald, Ubbelohde) Viscometer Calculation

Viscometer constant from a reference liquid, and the kinematic and dynamic viscosity of a sample from its efflux time, with the kinetic energy correction.

Method: Hagen–Poiseuille capillary viscometry with kinetic energy correction

Input parameters

Unit system: SI

Parameter	Value	Unit
Reference liquid kinematic viscosity	1.0034	cSt
Reference efflux time	340.00	s
Sample efflux time	512.00	s
Sample density	880.00	kg/m³
Kinetic energy correction constant (mm²)	0	

Calculated results

Parameter	Value	Unit
Viscometer constant (mm²/s²)	0.002951	
Sample kinematic viscosity	1.5110	cSt
Sample dynamic viscosity	1.3297	mPa·s
Kinetic energy correction share	0	%

Notes for this case

• Gravity-driven capillary flow is Hagen–Poiseuille, so ν = Ct − B/t: the first term is laminar flow, the second corrects for the kinetic energy given to the liquid. C comes from a reference liquid (water is 1.0034 mm²/s at 20 °C) or the maker's certificate; B is usually negligible for efflux times above about 200 s. Dynamic viscosity μ = ρν. Keep the bath temperature within ±0.02 K for accurate work.

Formula and method

$$C = \frac{\nu_{ref} + B/t_{ref}}{t_{ref}}, \quad \nu = Ct - \frac{B}{t}, \quad \mu = \rho\nu$$

Variables

ν_{ref}	Reference liquid kinematic viscosity	m²/s
t_{ref}	Reference efflux time	s
t	Sample efflux time	s
ρ	Sample density	kg/m³
B	Kinetic energy correction constant (mm²)	-
C	Viscometer constant (mm²/s²)	-
ν	Sample kinematic viscosity	m²/s
μ	Sample dynamic viscosity	Pa·s
$\frac{B/t^2}{C}$	Kinetic energy correction share	-

Method and standards

Capillary viscometer.

Assumptions and limits

- Newtonian liquid; laminar flow; same temperature for reference and sample.

References

Hagen–Poiseuille capillary viscometry with kinetic energy correction

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/chemical/physical-properties/capillary-viscometer

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Reopens the calculator with the inputs of this report.