Kolmogorov Microscale from Mixing Intensity G

Energy dissipation rate and Kolmogorov smallest eddy size in a mixed tank from the velocity gradient G or the power input and volume.

Input parameters

Unit system: SI

Parameter	Value	Unit
Mixing given as	Velocity gradient G	
Velocity gradient	100.00	1/s
Power input to the water	0.54600	kW
Tank volume	65.100	m³
Kinematic viscosity	1.3100e-06	m²/s
Density	999.70	kg/m³

Calculated results

Parameter	Value	Unit
Velocity gradient	100.00	1/s
Energy dissipation rate per unit mass	0.013100	J/kg
Kolmogorov microscale	114.46	µm

Notes for this case

• ε is in W/kg (shown as J/kg per second). Particles smaller than the Kolmogorov scale are moved by viscous shear (microscale flocculation); larger ones by turbulent eddies. Uniform dissipation (ε = mean) is assumed; near the impeller ε is far higher.

Formula and method

$$\varepsilon = \frac{P}{\rho V} = G^2 \nu, \quad \eta_K = \left(\frac{\nu^3}{\varepsilon}\right)^{1/4} = \left(\frac{\nu}{G}\right)^{1/2}$$

Variables

input	Mixing given as	-
G	Velocity gradient	1/s
P	Power input to the water	W
V	Tank volume	m³
ν	Kinematic viscosity	m²/s
ρ	Density	kg/m³
ε	Energy dissipation rate per unit mass	J/kg
η_K	Kolmogorov microscale	m

Method and standards

Kolmogorov scaling of turbulence.

Assumptions and limits

- Isotropic turbulence, uniform dissipation.

Report details

Report reference	FCC-VEXX-4C2E (the same inputs always give the same reference)
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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/environmental/drinking-water/kolmogorov-eddy-size

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.