Gas Diffusivity by Fuller–Schettler–Giddings

Binary diffusion coefficient of two gases at low pressure from temperature, pressure, molar masses and Fuller diffusion volumes (Perry Eq. 5-202).

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Temperature	25.000	°C
Pressure (absolute)	101.33	kPa
Molar mass of A	18.015	kg/kmol
Molar mass of B	28.960	kg/kmol
Diffusion volume of A Fuller atomic and molecular diffusion volumes (Perry's Table 5-12).	13.100	
Diffusion volume of B	19.700	

Calculated results

Parameter	Value	Unit
Diffusion coefficient	0.25090	cm²/s

Notes for this case

- Fuller's method averages about 5 % error for nonpolar gases at low pressure (Perry's).

Formula and method

$$D_{AB} = \frac{10^{-3}\, T^{1.75} \sqrt{1/M_A + 1/M_B}}{p\left[(\Sigma v_A)^{1/3} + (\Sigma v_B)^{1/3}\right]^2} \quad (\mathrm{cm^2/s};\ T\ \mathrm{K},\ p\ \mathrm{atm})$$

Variables

T	Temperature	K
p	Pressure	Pa
M_A	Molar mass of A	kg/kmol
M_B	Molar mass of B	kg/kmol
Σv_A	Diffusion volume of A	-
Σv_B	Diffusion volume of B	-
D_{AB}	Diffusion coefficient	m²/s

Method and standards

Fuller–Schettler–Giddings correlation.

Assumptions and limits

- Low pressure (absolute); nonpolar or weakly polar gases. A note appears above about 10 bar.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 5
- Eq. (5-202) and Table 5-12 (Fuller, Schettler and Giddings)

Report details

Report reference	FCC-RFV1-4FN1 (the same inputs always give the same reference)
Generated	17 November 2026, 19:34 UTC
Calculator	Gas Diffusivity by Fuller–Schettler–Giddings
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/fuller-gas-diffusivity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.