Alcohol Strength: % v/v, % w/w, g/L and US Proof

Converts alcoholic strength by volume to strength by mass, ethanol content in g/L and US proof, using the mixture density measured at the same temperature.

Method: Definitions: s_w = s_v ρ_e/ρ_m; US proof = 2 × % v/v (OIML R 22 density basis)

Input parameters

Unit system: SI

Parameter	Value	Unit
Strength by volume (% v/v)	94.400	%
Density of the mixture at 20 °C Measured, or from alcoholometric tables.	810.00	kg/m³
Ethanol density at 20 °C	789.24	kg/m³

Calculated results

Parameter	Value	Unit
Strength by mass (% w/w)	91.981	%
Ethanol content	745.04	g/L
US proof	188.80	

Notes for this case

- Ethanol and water contract on mixing, so % w/w needs the measured mixture density, not a blend of pure densities.

Formula and method

$$c = s_v \rho_e, \quad s_w = \frac{s_v \rho_e}{\rho_m}, \quad \text{proof}_{US} = 200\, s_v$$

Variables

s_v	Strength by volume (% v/v)	-
ρ_m	Density of the mixture at 20 °C	kg/m³
ρ_e	Ethanol density at 20 °C	kg/m³
s_w	Strength by mass (% w/w)	-
C	Ethanol content	kg/m³
proof	US proof	-

Method and standards

Definitions of strength by mass and ethanol content from the strength by volume and the densities at 20 °C. A note compares the density entered with the OIML R 22 density of a pure ethanol–water mixture of the same strength.

Assumptions and limits

- All at 20 °C.
- US proof is 2 × % v/v; the US definition refers to 60 °F, so a TTB-table proof differs slightly from this 20 °C figure.
- A density more than 0.5 % from the R 22 value for the strength gives a note.

References

- Definitions: s_w = s_v ρ_e/ρ_m; US proof = 2 × % v/v (OIML R 22 density basis)

Report details

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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/sugar-ethanol/alcoholometry/alcohol-strength-conversions

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.