Dissolved Oxygen (or Other Gas) Saturation in Water

Equilibrium concentration of oxygen, nitrogen, CO_2 or other gases dissolved in water at a temperature and partial pressure (IAPWS G7-04 Henry's constant).

Method: IAPWS G7-04; Guideline on the Henry's Constant and Vapor-Liquid Distribution Constant for Gases in H_2O and D_2O at High Temperatures (2004); dilute solution x = p_g/k_H; water density from IAPWS-IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Gas	Oxygen O_2	
Water temperature	25.000	°C
Total pressure above the water (absolute)	1.0132	bar
Gas share of the dry gas phase (air: O_2 20.95 %, N_2 78.08 %)	20.950	%

Calculated results

Parameter	Value	Unit
Henry's constant	4,364.1	MPa
Gas partial pressure	20.564	kPa
Mole fraction dissolved	4.7119	ppm
Concentration	8.3446	mg/L

Notes for this case

- IAPWS G7-04 is built for high temperatures; near ambient it may differ by a few per cent from precise low-temperature data.

Formula and method

$$p_g = y\,(p - p_s(T)), \quad x = \frac{p_g}{k_H(T)}, \quad c = x\,\frac{\rho_w}{M_w}\,M_g$$

Variables

gas	Gas	-
T	Water temperature	K
p	Total pressure above the water (absolute)	Pa
y	Gas share of the dry gas phase (air: O_2 20.95 %, N_2 78.08 %)	-
k_H	Henry's constant	Pa
p_g	Gas partial pressure	Pa
x	Mole fraction dissolved	-
c	Concentration	kg/m³

Method and standards

IAPWS G7-04.

Assumptions and limits

- Dilute, ideal gas phase: partial pressure without fugacity or Poynting corrections, so the result grows less accurate at high pressure (a note appears above 10 bar).
- For CO_2 and H_2S the result is the molecular dissolved gas only; bicarbonate, carbonate and HS^- formed by ionisation are not included.
- The water vapour pressure is from IAPWS-IF97; the Henry's constants of IAPWS G7-04 use the Wagner–Pruss vapour pressure internally. The difference is negligible here.

References

- IAPWS G7-04

• Guideline on the Henry's Constant and Vapor-Liquid Distribution Constant for Gases in H_2O and D_2O at High Temperatures (2004); dilute solution x = p_g/k_H; water density from IAPWS-IF97

Report details

Report reference	FCC-XYBJ-N9GH (the same inputs always give the same reference)
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Calculator	Dissolved Oxygen (or Other Gas) Saturation in Water
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/boilers-power-plant/water-treatment/dissolved-gas-saturation

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.