Gas ppm to mg/m³ and mg/Nm³ Conversion

Convert a gas concentration between ppm by volume and mg/m³ at any pressure and temperature, and mg/Nm³ at 0 °C and 101.325 kPa, from the molar mass.

Method: Ideal gas law: mg/m³ = ppm × M p / (R T)

Input parameters

Unit system: SI

Parameter	Value	Unit
Concentration (ppm by volume)	100.00	
Molar mass of the gas Default: SO_2, S + 2 O from the IUPAC conventional atomic weights (64.058 kg/kmol).	64.058	kg/kmol
Pressure (absolute)	1.0132	bar
Temperature	25.000	°C

Calculated results

Parameter	Value	Unit
Concentration at p and T	261.83	mg/m³
Concentration at 0 °C and 101.325 kPa	285.79	mg/Nm³
mg/m³ per ppm at p and T	2.6183	

Notes for this case

- Same basis as the ppm reading (wet or dry). Emission limits are usually in mg/Nm³ on dry gas at a reference O_2: correct for moisture and oxygen separately.

Formula and method

$$c_m = c_v \times 10^{-6}\,\frac{p\,M}{R\,T}, \quad c_N = c_v \times 10^{-6}\,\frac{M}{V_{m,N}}$$

Variables

c_v	Concentration (ppm by volume)	-
M	Molar mass of the gas	kg/kmol
p	Pressure (absolute)	Pa
T	Temperature	K
c_m	Concentration at p and T	kg/m³
c_N	Concentration at 0 °C and 101.325 kPa	kg/m³
k	mg/m³ per ppm at p and T	-

Method and standards

Ideal gas law.

Assumptions and limits

- Ideal gas.
- The result is on the same basis (wet or dry) as the ppm value; no dry-gas or reference-O_2 correction is made.

References

- Ideal gas law: mg/m³ = ppm × M p / (R T)

Report details

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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/instrumentation/analysers/ppm-mg-m3-conversion

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.