Compressed Air Pressure Dew Point to Atmospheric Dew Point

Atmospheric dew or frost point, vapour pressure and water content of compressed air from its pressure dew point and line pressure, over water and over ice.

Method: IAPWS-IF97 saturation over water; IAPWS R14-08(2011) sublimation pressure over ice; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Line pressure	8.0000	bar g
Pressure dew point	3.0000	°C
Atmospheric pressure	1.0132	bar

Calculated results

Parameter	Value	Unit
Water vapour partial pressure in the line	758.08	Pa
Dew or frost point after expansion to atmosphere	-21.983	°C
Water per kg of dry air	0.52353	g/kg
Water per normal m³ of dry air	0.67657	g/Nm³

Notes for this case

- Below 0 °C the dew point is taken over ice (frost point, IAPWS R14-08); above it over water (IAPWS-IF97). Ideal gas, no enhancement factor.

Formula and method

$$p_v = p_{sat}(T_{PDP})$$

$$p_{sat}(T_{ADP}) = p_v \frac{p_a}{p}$$

$$W = \frac{M_w}{M_a} \frac{p_v}{p - p_v}$$

Variables

p	Line pressure	Pa
T_{PDP}	Pressure dew point	K
p_a	Atmospheric pressure	Pa
p_v	Water vapour partial pressure in the line	Pa
T_{ADP}	Dew or frost point after expansion to atmosphere	K
W	Water per kg of dry air	kg/kg
c_w	Water per normal m³ of dry air	kg/m³
p_{sat}	Saturation pressure over water or ice	Pa
M_w/M_a	Molar mass ratio water to dry air (0.622)	-

Method and standards

Water vapour keeps its mole fraction when air expands, so its partial pressure falls in proportion to total pressure. Saturation is over liquid water (IAPWS-IF97) above 0.01 °C and over ice (IAPWS R14-08) below.

Assumptions and limits

- Ideal gas, no enhancement factor (at 10 bar and above the water content is under-estimated by roughly half a per cent).
- A line pressure entered as gauge is turned into absolute with the standard atmosphere; at altitude enter it as absolute (a note appears when p_a differs from 1.01325 bar).
- Dew point between −100 °C and 100 °C.

References

• IAPWS-IF97 saturation over water
• IAPWS R14-08(2011) sublimation pressure over ice
• ISO 8573-1 dew point classes (definitions)

Report details

Report reference	FCC-ZM9C-59AA (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Compressed Air Pressure Dew Point to Atmospheric Dew Point
Method last reviewed	12 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/mechanical/compressors/compressed-air-pressure-dew-point

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.