Wet Steam Properties from Dryness Fraction

Enthalpy, entropy, specific volume and internal energy of wet steam from its pressure and dryness fraction, or the dryness fraction from a known enthalpy (IAPWS-IF97).

Method: IAPWS-IF97 (water and steam)

Input parameters

Unit system: SI

Parameter	Value	Unit
Steam pressure (absolute)	11.013	bar
What you know besides the pressure	Dryness fraction	
Dryness fraction (when given)	90.000	%
Enthalpy of the wet steam (when given)	2,600.0	kJ/kg

Calculated results

Parameter	Value	Unit
Saturation temperature	184.12	°C
Dryness fraction	90.000	%
Enthalpy h = h_f + x h_fg	2,580.8	kJ/kg
Entropy s = s_f + x s_fg	6.1143	kJ/(kg·K)
Specific volume v = v_f + x (v_g − v_f)	0.15962	m³/kg
Internal energy u = h − p v	2,405.0	kJ/kg
Enthalpy of saturated water	781.43	kJ/kg
Latent heat of evaporation	1,999.3	kJ/kg
Enthalpy of dry saturated steam	2,780.7	kJ/kg

Notes for this case

- Wet steam: pressure and temperature are tied together, so the dryness fraction is needed to fix the state.

Formula and method

$$h = h_f + x\,h_{fg}, \quad s = s_f + x\,s_{fg}$$

$$v = v_f + x\,(v_g - v_f), \quad u = h - p\,v$$

$$x = \frac{h - h_f}{h_{fg}}$$

Variables

p	Steam pressure (absolute)	Pa
given	What you know besides the pressure	-
x	Dryness fraction (when given)	-
h_{given}	Enthalpy of the wet steam (when given)	J/kg
T_s	Saturation temperature	K
h	Enthalpy h = h_f + x h_fg	J/kg
s	Entropy s = s_f + x s_fg	J/(kg·K)
v	Specific volume v = v_f + x (v_g − v_f)	m³/kg
u	Internal energy u = h − p v	J/kg

h_f	Enthalpy of saturated water	J/kg
h_{fg}	Latent heat of evaporation	J/kg
h_g	Enthalpy of dry saturated steam	J/kg

Method and standards

Saturated water and dry saturated steam properties at the pressure come from IAPWS-IF97; wet steam is the mass-weighted mix of the two phases.

Assumptions and limits

- Wet steam only (dryness 0 to 1).
- Equilibrium properties; no superheat.

References

- IAPWS-IF97 (water and steam)

Report details

Report reference	FCC-G9X9-9WQB (the same inputs always give the same reference)
Generated	17 November 2026, 19:37 UTC
Calculator	Wet Steam Properties from Dryness Fraction
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/boilers-power-plant/steam/wet-steam-dryness-fraction

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.