Saturation Temperature and Pressure of Steam

Boiling temperature at a pressure or saturation pressure at a temperature, with liquid and vapour enthalpy, latent heat, entropy and specific volume (IAPWS-IF97).

Method: IAPWS R7-97(2012) IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Look up by	Pressure	
Pressure (absolute) Absolute. Choose a gauge unit (bar g, psig) to enter gauge readings.	10.000	bar
Temperature	180.00	°C

Calculated results

Parameter	Value	Unit
Saturation pressure	10.000	bar
Saturation temperature	179.89	°C
Saturated liquid enthalpy	762.68	kJ/kg
Saturated vapour enthalpy	2,777.1	kJ/kg
Latent heat of vaporisation	2,014.4	kJ/kg
Saturated liquid entropy	2.1384	kJ/(kg·K)
Saturated vapour entropy	6.5850	kJ/(kg·K)
Saturated liquid specific volume	0.001127	m³/kg
Saturated vapour specific volume	0.19435	m³/kg

Formula and method

$$T_{sat} = T_{sat}(p) \quad \text{or} \quad p_{sat} = p_{sat}(T) \qquad h_{fg} = h_g - h_f$$

Variables

mode	look up by pressure or by temperature	–
p	absolute pressure entered	Pa
T	temperature entered	K
p_{sat}	saturation pressure	Pa
T_{sat}	saturation (boiling) temperature	K
h_f	saturated liquid enthalpy	J/kg
h_g	saturated vapour enthalpy	J/kg
h_{fg}	latent heat of vaporisation	J/kg
s_f	saturated liquid entropy	J/(kg·K)
s_g	saturated vapour entropy	J/(kg·K)
v_f	saturated liquid specific volume	m³/kg
v_g	saturated vapour specific volume	m³/kg

Method and standards

IAPWS R7-97(2012), the Industrial Formulation 1997: region 4 saturation equation for $p_{sat}(T)$ and its inverse $T_{sat}(p)$; region 1 for the liquid and region 2 for the vapour up to 350 °C, and region 3 (by iteration on density) from 350 °C to the critical point. Enthalpy and entropy are referenced to the triple-point liquid, as in every IF97 steam table.

Assumptions and limits

- Pure water; dissolved solids raise the boiling point slightly.
- Valid from the triple point (0.01 °C, 611.657 Pa) to the critical point (373.946 °C, 220.64 bar).
- Pressure is absolute.

References

• IAPWS R7-97(2012) IF97

Report details

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Software release	FireCAD Calc, release of 17 November 2026
Release checks	4 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/saturation-pressure-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.