Steam Consumption from Heat Duty

Steam flow a heater, exchanger or process needs for a given heat duty, from the steam and condensate enthalpies (IAPWS-IF97).

Method: IAPWS R7-97(2012) IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Heat duty	1,000.0	kW
Steam pressure at the user (absolute) Absolute. Choose a gauge unit (bar g, psig) to enter gauge readings.	8.0000	bar
Steam condition	Dry saturated	
Steam temperature (superheated only)	250.00	°C
Condensate sub-cooling below saturation 0 for condensate leaving as saturated liquid (steam trap at the outlet).	0	K

Calculated results

Parameter	Value	Unit
Steam flow	1,758.4	kg/h
Saturation temperature at p	170.41	°C
Steam enthalpy	2,768.3	kJ/kg
Condensate enthalpy	721.02	kJ/kg
Heat given up per kg of steam	2,047.3	kJ/kg

Formula and method

$$\dot{m}_s = \frac{\dot{Q}}{\Delta h} \qquad \Delta h = h_s - h_c \qquad h_c = h(p,\, T_{sat} - \Delta T_{sc})$$

Variables

$\dot{Q}$	heat duty delivered by the steam	W
p	absolute steam pressure at the user	Pa
state	dry saturated, or superheated at T_s	–
T_s	steam temperature when superheated	K
ΔT_{sc}	condensate sub-cooling below saturation	K
$\dot{m}_s$	steam flow	kg/s
T_{sat}	saturation temperature at p	K
h_s	steam enthalpy	J/kg
h_c	condensate enthalpy	J/kg
Δh	heat given up per kg of steam	J/kg

Method and standards

Steam and condensate enthalpies from FireCAD's IAPWS-IF97 implementation: region 2 for superheated steam (region 3 close to the critical point), the saturation line for dry saturated steam, region 1 for the condensate at the steam pressure.

Assumptions and limits

- Steady state; no heat lost from the equipment to the surroundings.
- Condensate leaves at the steam pressure; the sub-cooling is relative to the saturation temperature at that pressure.
- Wet steam (dryness below 1) is not an input; it gives up less heat per kg.

References

• IAPWS R7-97(2012) IF97

Report details

Report reference	FCC-D4PV-8CWN (the same inputs always give the same reference)
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Calculator	Steam Consumption from Heat Duty
Method last reviewed	10 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/steam-flow-from-heat-duty

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.