Mixing of Two Steam Streams (Dryness or Temperature)

State of the steam when two flows at the same pressure mix without heat loss: the mixed enthalpy, and its dryness fraction or superheated temperature (IAPWS-IF97).

Method: IAPWS-IF97 (water and steam)

Input parameters

Unit system: SI

Parameter	Value	Unit
Pressure of both streams and the mixture (absolute)	10.000	bar g
Flow of stream 1	2,000.0	kg/h
State of stream 1	Wet or dry saturated, at the dryness below	
Dryness fraction of stream 1	90.000	%
Temperature of stream 1 (superheated)	250.00	°C
Flow of stream 2	3,000.0	kg/h
State of stream 2	Superheated, at the temperature below	
Dryness fraction of stream 2	100.00	%
Temperature of stream 2 (superheated)	250.00	°C

Calculated results

Parameter	Value	Unit
Enthalpy of stream 1	2,580.8	kJ/kg
Enthalpy of stream 2	2,939.4	kJ/kg
Enthalpy of the mixture	2,796.0	kJ/kg
Dryness fraction of the mixture (1 when superheated)	100.00	%
Temperature of the mixture	189.78	°C
Superheat of the mixture (0 when wet)	5.6544	K

Notes for this case

- Adiabatic mixing at constant pressure: the mixed enthalpy is the flow-weighted mean; no heat is lost and no pressure drops.

Formula and method

$$h_m = \frac{\dot{m}_1 h_1 + \dot{m}_2 h_2}{\dot{m}_1 + \dot{m}_2}$$

$$x_m = \frac{h_m - h_f}{h_{fg}} \ (h_m \le h_g), \qquad T_m = T(p, h_m) \ (h_m > h_g)$$

Variables

p	Pressure of both streams and the mixture (absolute)	Pa
$\dot{m}_1$	Flow of stream 1	kg/s
state_1	State of stream 1	-
x_1	Dryness fraction of stream 1	-
T_1	Temperature of stream 1 (superheated)	K
$\dot{m}_2$	Flow of stream 2	kg/s

state_2	State of stream 2	-
x_2	Dryness fraction of stream 2	-
T_2	Temperature of stream 2 (superheated)	K
h_1	Enthalpy of stream 1	J/kg
h_2	Enthalpy of stream 2	J/kg
h_m	Enthalpy of the mixture	J/kg
x_m	Dryness fraction of the mixture (1 when superheated)	-
T_m	Temperature of the mixture	K
ΔT_{sh}	Superheat of the mixture (0 when wet)	K

Method and standards

Steady adiabatic mixing at constant pressure (energy balance). Each stream's enthalpy and the mixed state from IAPWS-IF97.

Assumptions and limits

- Both streams and the mixture at one pressure. A stream from a higher-pressure line is throttled into the header at constant enthalpy: find its enthalpy at its own pressure (steam property calculators) and enter the state at the header pressure that has the same enthalpy.
- A superheated stream must be entered as superheated with its temperature; "dry saturated" at dryness 1 gives h_g, not the superheated enthalpy.
- No heat loss; no water drained.

References

• IAPWS-IF97 (water and steam)

Report details

Report reference	FCC-KZMS-KVHA (the same inputs always give the same reference)
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Calculator	Mixing of Two Steam Streams (Dryness or Temperature)
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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/boilers-power-plant/steam/mixing-steam-streams

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.