# Attemperator Outlet Temperature for a Spray Flow

Steam temperature after an attemperator or desuperheater for a given spray water flow, with the remaining superheat, by an enthalpy balance (IAPWS-IF97).

**Method:** IAPWS R7-97 IF97; adiabatic mixing

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Steam flow in | 50,000 | kg/h |
| Steam pressure (absolute) | 66.000 | bar |
| Steam temperature in | 520.00 | °C |
| Spray water flow | 2,000.0 | kg/h |
| Spray water pressure (absolute) | 90.000 | bar |
| Spray water temperature | 150.00 | °C |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Steam temperature out | 474.91 | °C |
| Superheat remaining | 193.03 | K |
| Steam flow out | 52,000 | kg/h |
| Steam enthalpy out | 3,355.2 | kJ/kg |

## Formula and method

$$h_2 = \frac{\dot{m}_s h_s + \dot{m}_w h_w}{\dot{m}_s + \dot{m}_w} \qquad T_2 = T(p, h_2) \qquad \Delta T_{sh} = T_2 - T_{sat}(p)$$

### Variables

| | | |
|---|---|---|
| $\dot{m}_s$ | steam flow in | kg/s |
| $p$ | steam pressure | Pa |
| $T_s$ | steam temperature in | K |
| $\dot{m}_w$ | spray water flow | kg/s |
| $p_w$ | spray water pressure | Pa |
| $T_w$ | spray water temperature | K |
| $T_2$ | steam temperature out | K |
| $\Delta T_{sh}$ | superheat remaining | K |
| $\dot{m}_2$ | steam flow out | kg/s |
| $h_2$ | outlet enthalpy | J/kg |
| $h_s, h_w$ | steam and water enthalpies (IF97) | J/kg |

### Method and standards

Adiabatic mixing at the steam pressure with enthalpies and the outlet state from FireCAD's IAPWS-IF97.

### Assumptions and limits

- Complete evaporation and mixing; no heat loss. The spray water enthalpy at its own pressure is unchanged through the valve and nozzle (isenthalpic throttling), so the balance is on enthalpy at the steam pressure.
- If the outlet is wet, the temperature shown is the saturation temperature and a warning gives the outlet dryness.
- The 10 K superheat warning is a FireCAD rule-of-thumb margin, not a code value.
- Above the critical pressure (220.64 bar) there is no saturation temperature, so the superheat is not shown.

### References

- IAPWS R7-97 IF97
- adiabatic mixing

## Report details

| | |
|---|---|
| Report reference | FCC-CW9C-PQ9M (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:36 UTC |
| Calculator | Attemperator Outlet Temperature for a Spray Flow |
| Method last reviewed | 11 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/attemperator-mixing-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.