Separating Calorimeter Dryness Fraction

Dryness fraction of wet steam from a separating calorimeter: the water separated and the dry steam condensed in the same time, with the enthalpy of the sample steam.

Method: IAPWS-IF97 (water and steam); Separating calorimeter mass balance (textbook)

Input parameters

Unit system: SI

Parameter	Value	Unit
Steam pressure in the main (absolute)	7.8453	bar g
Water collected in the separator	0.40000	kg
Steam condensed after the separator	8.0000	kg

Calculated results

Parameter	Value	Unit
Dryness fraction x = m_c / (m_c + m_w)	95.238	%
Wetness fraction	4.7619	%
Enthalpy of the steam in the main	2,675.6	kJ/kg
Saturation temperature	174.69	°C

Notes for this case

• A separator never removes all the water, so this dryness fraction is a little high; for very wet steam follow it with a throttling calorimeter.

Formula and method

$$x = \frac{m_c}{m_c + m_w}$$

$$h = h_f + x\, h_{fg}$$

Variables

p	Steam pressure in the main (absolute)	Pa
m_w	Water collected in the separator	kg
m_c	Steam condensed after the separator	kg
x	Dryness fraction x = m_c / (m_c + m_w)	-
$1 - x$	Wetness fraction	-
h	Enthalpy of the steam in the main	J/kg
T_s	Saturation temperature	K

Method and standards

Mass balance on the separator: the condensate is the dry steam passed, the water collected is the moisture removed. Saturation properties from IAPWS-IF97.

Assumptions and limits

- The separator efficiency is taken as 100 %.
- Masses collected over the same period.

References

• IAPWS-IF97 (water and steam)
• Separating calorimeter mass balance (textbook)

Report details

Report reference	FCC-H9PR-RSR9 (the same inputs always give the same reference)
Generated	17 November 2026, 19:35 UTC
Calculator	Separating Calorimeter 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/separating-calorimeter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.