Reactor Coolant Flow from Core Power and Loop Temperatures

Reactor coolant mass and volume flow, total and per loop, from core thermal power and the hot-leg and cold-leg temperatures at system pressure.

Method: Primary circuit energy balance

Input parameters

Unit system: SI

Parameter	Value	Unit
Core thermal power (plus pump heat if wanted)	3,000.0	MW
Primary pressure	15.500	MPa
Hot-leg temperature	325.00	°C
Cold-leg temperature	292.00	°C
Number of loops	4.0000	

Calculated results

Parameter	Value	Unit
Total coolant mass flow	56,974	t/h
Mass flow per loop	14,243	t/h
Volume flow per loop at the cold leg	19,186	m³/h
Enthalpy rise across the core	189.56	kJ/kg
Core temperature rise	33.000	K

Notes for this case

• ṁ = Q/(h_hot − h_cold). Flow through bypass paths (head cooling, guide tubes) is extra; thermal design flow is usually a few per cent below the best-estimate flow. Water and steam properties from IAPWS-IF97.

Formula and method

$$\dot{m} = \frac{Q}{h(p, T_h) - h(p, T_c)}$$

Variables

Q	Core thermal power (plus pump heat if wanted)	W
p	Primary pressure	Pa
T_h	Hot-leg temperature	K
T_c	Cold-leg temperature	K
n	Number of loops	-
$\dot{m}$	Total coolant mass flow	kg/s
$\dot{m}_{loop}$	Mass flow per loop	kg/s
$\dot{V}_c$	Volume flow per loop at the cold leg	m³/s
Δh	Enthalpy rise across the core	J/kg
ΔT	Core temperature rise	K

Method and standards

Primary loop energy balance.

Assumptions and limits

- Steady state; single phase.

References

Primary circuit energy balance

Report details

Report reference	FCC-9YEH-4SXN (the same inputs always give the same reference)
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Software release	FireCAD Calc, release of 22 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/nuclear-power/reactor-coolant-flow-from-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.