Two Identical Fans in Parallel or Series on a System

Operating flow and pressure of one fan, two identical fans in parallel and two in series on one system curve, from a quadratic fan curve and system resistance.

Method: Fan and system curve intersection

Input parameters

Unit system: SI

Parameter	Value	Unit
Fan shut-off pressure	203.94	mmWC
Fan curve point: flow	36,000	m³/h
Fan curve point: pressure at Q_1	152.96	mmWC
System curve point: flow	36,000	m³/h
System curve point: pressure at Q_s	142.76	mmWC

Calculated results

Parameter	Value	Unit
Flow with one fan	36,935	m³/h
Pressure with one fan	150.27	mmWC
Flow with two in parallel	41,227	m³/h
Parallel gain	1.1162	
Flow with two in series	46,476	m³/h
Series gain	1.2583	

Notes for this case

• Fan curve p = p_0 − aQ² through shut-off and one point; system p = kQ². Parallel fans share the flow (each at Q/2); series fans add pressure. Parallel helps low-resistance systems, series helps high-resistance ones; neither doubles the flow. Real curves with stall dips can make parallel operation unstable.

Formula and method

$$p = p_0 - aQ^2, \quad Q_{par} = \sqrt{\frac{p_0}{a/4 + k}}, \quad Q_{ser} = \sqrt{\frac{2p_0}{2a + k}}$$

Variables

p_0	Fan shut-off pressure	Pa
Q_1	Fan curve point: flow	m³/s
p_1	Fan curve point: pressure at Q_1	Pa
Q_s	System curve point: flow	m³/s
p_s	System curve point: pressure at Q_s	Pa
Q_{one}	Flow with one fan	m³/s
p_{one}	Pressure with one fan	Pa
Q_{par}	Flow with two in parallel	m³/s
Q_{par}/Q_{one}	Parallel gain	-
Q_{ser}	Flow with two in series	m³/s
Q_{ser}/Q_{one}	Series gain	-

Method and standards

Fan combination.

Assumptions and limits

- Quadratic curves; identical fans; no interaction losses.

References

Fan and system curve intersection

Report details

Report reference	FCC-9B8X-H46T (the same inputs always give the same reference)
Generated	23 November 2026, 18:24 UTC
Calculator	Two Identical Fans in Parallel or Series on a System
Method last reviewed	17 November 2026
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/mechanical/fans/fans-parallel-series-operation

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.