Fan Temperature Rise

Temperature rise of air or gas through a fan from its pressure rise, density, specific heat and efficiency, and the outlet temperature.

Method: Energy balance on the fan (ISO 5801 power definitions)

Input parameters

Unit system: SI

Parameter	Value	Unit
Fan total pressure rise	305.91	mmWC
Gas density at the inlet	1.1500	kg/m³
Specific heat of the gas Air about 1.006 kJ/(kg·K); flue gas about 1.05–1.10 kJ/(kg·K).	1.0060	kJ/(kg·K)
Fan efficiency	80.000	%
Inlet temperature	35.000	°C

Calculated results

Parameter	Value	Unit
Temperature rise through the fan	3.2414	K
Outlet temperature	38.241	°C

Formula and method

$$\Delta T = \frac{\Delta p}{\rho \, c_p \, \eta_f} \qquad T_2 = T_1 + \Delta T$$

Variables

Δp	fan total pressure rise	Pa
ρ	gas density at the inlet	kg/m³
c_p	specific heat of the gas	J/(kg·K)
η_f	fan efficiency	–
T_1	inlet temperature	K
ΔT	temperature rise	K
T_2	outlet temperature	K

Method and standards

Energy balance on the fan: all the shaft power ends up in the gas, as useful pressure rise and as heat from the losses. With air power $\dot{V}\Delta p$ and shaft power $\dot{V}\Delta p/\eta$, the gas gains $\Delta p/(\rho\eta)$ per kg.

Assumptions and limits

- Adiabatic fan casing; bearing losses outside the gas stream are included (conservative).
- Incompressible; for blowers above about 20 kPa use the isentropic relation instead (flagged).

References

- Energy balance on the fan (ISO 5801 power definitions)

Report details

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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/fan-temperature-rise

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Reopens the calculator with the inputs of this report.