Fan Sound Power, Blade-Passing Frequency and Sound Pressure

Fan sound power level from a specific sound power level, flow and pressure, the blade-passing frequency and the sound pressure level at a distance.

Method: Specific sound power method for fans

Input parameters

Unit system: SI

Parameter	Value	Unit
Specific sound power level (from maker or reference data, dB)	30.000	
Volume flow	36,000	m³/h
Fan pressure	152.96	mmWC
Number of blades	10.000	
Speed	1,480.0	rpm
Distance from the fan (free field)	10.000	m
Radiation	Hemispherical (on a hard floor)	

Calculated results

Parameter	Value	Unit
Sound power level (dB)	103.52	
Blade-passing frequency	246.67	Hz
Sound pressure level at r (dB)	75.540	

Notes for this case

• L_W = L_Ws + 10 log Q + 20 log Δp (Q in m³/s, Δp in Pa): sound power rises 6 dB for each doubling of pressure and 3 dB for each doubling of flow. Blade-passing tone at zn. Sound pressure by spherical or hemispherical spreading without room effects.

Formula and method

$$L_W = L_{Ws} + 10\log_{10} Q + 20\log_{10} \Delta p, \quad f_{BP} = \frac{zn}{60}, \quad L_p = L_W - 10\log_{10}(2\pi r^2)$$

Variables

L_{Ws}	Specific sound power level (from maker or reference data, dB)	-
Q	Volume flow	m³/s
Δp	Fan pressure	Pa
z	Number of blades	-
n	Speed	rad/s
r	Distance from the fan (free field)	m
field	Radiation	-
L_W	Sound power level (dB)	-
f_{BP}	Blade-passing frequency	1/s
L_p	Sound pressure level at r (dB)	-

Method and standards

Fan noise estimate.

Assumptions and limits

- Specific sound power from data; free-field spreading.

References

Specific sound power method for fans

Report details

Report reference	FCC-S2F7-Q85Y (the same inputs always give the same reference)
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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-sound-power-estimate

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.