Fan and Impeller Tip Speed

Tip (peripheral) speed of a fan or pump impeller from diameter and speed, with the speed for a tip-speed limit and the blade passing frequency.

Method: u = π D N

Input parameters

Unit system: SI

Parameter	Value	Unit
Impeller diameter	1,200.0	mm
Speed	990.00	rpm
Number of blades	12.000	
Tip speed limit (for the highest speed) From the fan maker or your specification.	90.000	m/s

Calculated results

Parameter	Value	Unit
Tip speed π D N	62.204	m/s
Highest speed for the tip limit	1,432.4	rpm
Blade passing frequency	198.00	Hz

Formula and method

$$u = \pi D N, \quad f_b = z N$$

Variables

D	Impeller diameter	m
N	Speed	1/s
z	Number of blades	-
u_{max}	Tip speed limit (for the highest speed)	m/s
u	Tip speed π D N	m/s
N_{max}	Highest speed for the tip limit	1/s
f_b	Blade passing frequency	1/s

Method and standards

Kinematics.

Assumptions and limits

- Rigid rotor.
- A tip speed above the entered limit is flagged.

References

- u = π D N

Report details

Report reference	FCC-R2EX-KJJD (the same inputs always give the same reference)
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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/mechanical/fans/fan-tip-speed

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.