Speed of Sound in a Gas and Mach Number

Speed of sound in an ideal gas from the ratio of specific heats, molar mass and temperature, and the Mach number of a gas velocity.

Method: Ideal gas; c = √(γ R T/M)

Input parameters

Unit system: SI

Parameter	Value	Unit
Ratio of specific heats	1.4000	
Molar mass	28.960	kg/kmol
Temperature	20.000	°C
Gas velocity (for the Mach number)	60.000	m/s

Calculated results

Parameter	Value	Unit
Speed of sound √(γ R T / M)	343.26	m/s
Mach number v/c	0.17479	

Formula and method

$$c = \sqrt{\gamma \frac{R}{M} T}, \quad Ma = \frac{v}{c}$$

Variables

γ	Ratio of specific heats	-
M	Molar mass	kg/kmol
T	Temperature	K
v	Gas velocity (for the Mach number)	m/s
c	Speed of sound √(γ R T / M)	m/s
Ma	Mach number v/c	-

Method and standards

Ideal gas acoustics.

Assumptions and limits

- Ideal gas.

References

- Ideal gas
- c = √(γ R T/M)

Report details

Report reference	FCC-XCRY-JV8B (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Speed of Sound in a Gas and Mach Number
Method last reviewed	12 November 2026
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/fluid-mechanics/speed-of-sound-gas

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.