

## Acoustics Formulas, Symbols, Expressions, and Units

Concept	Symbol	Formula/Expression	Unit
Speed of Sound	v	$v = f * \lambda$	m/s
Frequency	f	$f = v / \lambda$	Hz (Hertz)
Wavelength	$\lambda$	$\lambda = v / f$	m (meters)
Sound Intensity	I	$I = P / A$	W/m <sup>2</sup> (Watts per square meter)
Decibel Level	L	$L = 10 * \log_{10}(I / I_0)$	dB (decibel)
Doppler Effect (Moving Source)	f'	$f' = f * (v + v_o) / (v - v_s)$	Hz
Doppler Effect (Moving Observer)	f	$f' = f * (v + v_o) / v$	Hz
Sound Pressure	p	$p = F / A$	Pa (Pascal)
Resonant Frequency	f <sub>r</sub>	$f_r = (n * v) / (2L)$	Hz
Time Period	T	$T = 1 / f$	s (seconds)
Bulk Modulus	B	$B = -\Delta P / (\Delta V / V)$	Pa (Pascal)
Density of Medium	$\rho$	$\rho = m / V$	kg/m <sup>3</sup>
Amplitude of Wave	A	Variable dependent on source	Dependent on application
Power of Sound Source	P	$P = I * A$	W (Watts)
Angular Frequency	$\omega$	$\omega = 2 * \pi * f$	rad/s
Phase Difference	$\Delta \phi$	$\Delta \phi = (2 * \pi / \lambda) * \Delta x$	radians
Threshold of Hearing	I <sub>0</sub>	N/A	10 <sup>-12</sup> W/m <sup>2</sup>
Mach Number	M	$M = v / v_s$	Dimensionless
Reynolds Number	Re	$Re = (\rho * v * D) / \mu$	Dimensionless