

Table of Elastic Constants for isotropic media

Symbol	E	$\sigma$ (sigma)	<i>K</i> or <i>k</i>	M	$\lambda$ (lambda)	$\mu$ (mu)	$\lambda/\mu$	$V_p$	$V_s$	$V_p/V_s$
Entity	Young's modulus	Poisson's Ratio	Bulk modulus	P-wave modulus	Lamé parameter	Lamé parameter	Lamé Imp. ratio	V-primary	V-secondary	$V_p/V_s$ ratio
Comment		( $\nu$ by Mavko et al, 1998) dimensionless			$\lambda\rho(\ddagger)$ : fluid incompressibility	$\mu\rho(\ddagger)$ : Matrix rigidity	Gas sand indicator	Compressional velocity	Shear velocity	$Z_p/Z_s$ ratio dimensionless
Notes: All moduli have the dimension of stress. ( $\ddagger$ ) $\lambda\rho$ and $\mu\rho$ are the Lamé impedances, and their ratio $\lambda/\mu$ is dimensionless.										
(E, $\sigma$ )			$\frac{E}{3(1-2\sigma)}$	$\frac{E(1-\sigma)}{(1+\sigma)(1-2\sigma)}$	$\frac{E\sigma}{(1+\sigma)(1-2\sigma)}$	$\frac{E}{2(1+\sigma)}$	$\frac{2\sigma}{1-2\sigma}$	$\sqrt{\frac{E(1-\sigma)}{(1+\sigma)(1-2\sigma)\rho}}$	$\sqrt{\frac{E}{2(1+\sigma)\rho}}$	$\sqrt{\frac{1-\sigma}{1/2-\sigma}}$
(E, <i>k</i> )		$\frac{3k-E}{6k}$		$3k\frac{3k+E}{9k-E}$	$3k\frac{3k-E}{9k-E}$	$\frac{3kE}{9k-E}$	$\frac{3k}{E}-1$	$\sqrt{\frac{3k}{\rho}\frac{3k+E}{9k-E}}$	$\sqrt{\frac{3kE}{(9k-E)\rho}}$	$\sqrt{\frac{3k+E}{E}}$
(E, $\mu$ )		$\frac{E-2\mu}{2\mu}$	$\frac{\mu E}{3(3\mu-E)}$	$\mu\frac{4\mu-E}{3\mu-E}$	$\mu\frac{E-2\mu}{3\mu-E}$			$\sqrt{\frac{\mu(4\mu-E)}{\rho(3\mu-E)}}$	$\sqrt{\frac{\mu}{\rho}}$	$\sqrt{\frac{4\mu-E}{3\mu-E}}$
( $\sigma$ , <i>k</i> )	$3k(1-2\sigma)$			$3k\frac{1-\sigma}{1+\sigma}$	$3k\frac{\sigma}{1+\sigma}$	$\frac{3k}{2}\frac{1-2\sigma}{1+\sigma}$	$\frac{2\sigma}{1-2\sigma}$	$\sqrt{\frac{3k}{\rho}\frac{1-\sigma}{1+\sigma}}$	$\sqrt{\frac{3k}{2\rho}\frac{1-2\sigma}{1+\sigma}}$	$\sqrt{\frac{1-\sigma}{1/2-\sigma}}$
( $\sigma$ , $\mu$ )	$2\mu(1+\sigma)$		$\frac{2\mu(1+\sigma)}{3(1-2\sigma)}$	$2\mu\frac{1-\sigma}{1-2\sigma}$	$\mu\frac{2\sigma}{1-2\sigma}$			$\sqrt{\frac{2\mu}{\rho}\frac{1-\sigma}{1-2\sigma}}$	$\sqrt{\frac{\mu}{\rho}}$	$\sqrt{\frac{1-\sigma}{1/2-\sigma}}$
( $\sigma$ , $\lambda$ )	$\lambda\frac{(1+\sigma)(1-2\sigma)}{\sigma}$		$\lambda\frac{1+\sigma}{3\sigma}$	$\lambda\frac{1-\sigma}{\sigma}$		$\lambda\frac{1-2\sigma}{2\sigma}$		$\sqrt{\frac{\lambda}{\rho}\frac{1-\sigma}{\sigma}}$	$\sqrt{\frac{\lambda}{\rho}\frac{1-2\sigma}{2\sigma}}$	$\sqrt{\frac{1-\sigma}{1/2-\sigma}}$
( <i>k</i> , $\mu$ )	$\frac{9k\mu}{3k+\mu}$	$\frac{3k-2\mu}{2(3k+\mu)}$		$K+4\mu/3$	$k-2\mu/3$			$\sqrt{\frac{k+4\mu/3}{\rho}}$	$\sqrt{\frac{\mu}{\rho}}$	$\sqrt{\frac{k+4\mu/3}{\mu}}$
( <i>k</i> , $\lambda$ )	$9k\frac{k-\lambda}{3k-\lambda}$	$\frac{\lambda}{3k-\lambda}$		$3k-2\lambda$		$3(k-\lambda)/2$		$\sqrt{\frac{3k-2\lambda}{\rho}}$	$\sqrt{\frac{3(k-\lambda)}{2\rho}}$	$\sqrt{2\frac{k-2\lambda/3}{k-\lambda}}$
( $\mu$ , $\lambda$ )	$\mu\frac{3\lambda+2\mu}{\lambda+\mu}$	$\frac{\lambda}{2(\lambda+\mu)}$	$\lambda+2\mu/3$	$\lambda+2\mu$				$\sqrt{\frac{\lambda+2\mu}{\rho}}$	$\sqrt{\frac{\mu}{\rho}}$	$\sqrt{\frac{\lambda+2\mu}{\mu}}$
( $V_p, V_s$ )	$\frac{\rho V_s^2(3V_p^2-4V_s^2)}{V_p^2-V_s^2}$	$\frac{V_p^2-2V_s^2}{2(V_p^2-V_s^2)}$	$\rho(V_p^2-4V_s^2/3)$	$\rho V_p^2$	$\rho(V_p^2-2V_s^2)$	$\rho V_s^2$	$\left(\frac{V_p}{V_s}\right)^2-2$			

**Suggested reading.** “AVO and Lamé constants for rock parameterization and fluid detection” by Goodway (CSEG Recorder, 2001). “Foundations of anisotropy for exploration seismics” by Helbig, *Handbook of Geophysical Exploration*, Section I, vol. 22 (Pergamon/Elsevier, 1994). *The Rock Physics Handbook: Tools for Seismic Analysis in Porous Media* by Mavko et al. (Cambridge University Press, 1991). *Encyclopedic Dictionary of Exploration Geophysics* by Sheriff (SEG, 2005). **TLE**

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