Elastic Constants: E, G, K and Poisson's Ratio

Shear modulus, bulk modulus and Lamé constant of an isotropic material from Young's modulus and Poisson's ratio, or Poisson's ratio from E and G.

Method: Isotropic elasticity G = E/(2(1 + ν)); K = E/(3(1 − 2ν)); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Values given	E and v	
Young's modulus	200.00	GPa
Poisson's ratio	0.30000	
Shear modulus	77.000	GPa

Calculated results

Parameter	Value	Unit
Poisson's ratio	0.30000	
Shear modulus	76.923	GPa
Bulk modulus	166.67	GPa
Lamé's first parameter	115.38	GPa

Formula and method

$$G = \frac{E}{2(1+\nu)}, \quad K = \frac{E}{3(1-2\nu)}, \quad \lambda = \frac{E\nu}{(1+\nu)(1-2\nu)}$$

Variables

given	Values given	-
E	Young's modulus	Pa
ν	Poisson's ratio	-
G	Shear modulus	Pa
K	Bulk modulus	Pa
λ	Lamé's first parameter	Pa

Method and standards

Isotropic elasticity.

Assumptions and limits

- Isotropic, linear elastic.

References

- Isotropic elasticity G = E/(2(1 + ν))
- K = E/(3(1 − 2ν))
- λ = Eν/((1 + ν)(1 − 2ν))

Report details

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Release checks	2 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/materials/properties/elastic-constants-conversion

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.