Elastomer Modulus from Shore A Hardness

Young's modulus and shear modulus of a rubber or elastomer estimated from its Shore A durometer hardness by Gent's relation.

Method: Gent (1958); Trans. Inst. Rubber Ind. 34: 46 (E from the indentation of the durometer spring)

Input parameters

Unit system: SI

Parameter	Value	Unit
Shore A hardness	80.000	

Calculated results

Parameter	Value	Unit
Young's modulus	9.3514	MPa
Shear modulus	3.1171	MPa

Notes for this case

- Gent's relation for incompressible rubber; accuracy is about ±20 % and depends on filler and test time.

Formula and method

$$E = \frac{0.0981(56 + 7.62336 S_A)}{0.137505(254 - 2.54 S_A)} \text{ MPa}$$

Variables

S_A	Shore A hardness	-
E	Young's modulus	Pa
G	Shear modulus	Pa

Method and standards

Gent's relation.

Assumptions and limits

- Incompressible rubber; 40–90 Shore A.

References

- Gent (1958)
- Trans. Inst. Rubber Ind. 34: 46 (E from the indentation of the durometer spring)

Report details

Report reference	FCC-HYK4-97BK (the same inputs always give the same reference)
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Calculator	Elastomer Modulus from Shore A Hardness
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/shore-hardness-modulus

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.