

What does each property quantify?

Steel Properties: Strength, Hardness & Toughness

Concept	Relation / symbol	Typical quantitative form	Use and limitation
Engineering stress	$\sigma = F / A_0$	MPa	Basis of the tensile curve; not an acceptance limit by itself.
Engineering strain	$\epsilon = \Delta L / L_0$	dimensionless or %	Relative extension; depends on specimen geometry and gauge length.
Elastic modulus	$E = \sigma / \epsilon$ in elastic range	GPa	Measures stiffness, not strength.
Yield strength	YS / Rp0.2 as applicable	minimum or measured MPa	Onset of permanent deformation by the test definition; not allowable stress.
Tensile strength	$TS = F_{max} / A_0$	minimum or range in MPa	Maximum engineering tensile stress; not toughness or creep strength.
Elongation	$A = (L_f - L_0) / L_0 \times 100$	% with gauge length	Ductility indicator; do not compare without specimen definition.
Hardness	HBW / HRB / HRC / HV	scale value	Local material/process control; not a universal TS converter.
Impact energy	Charpy V-notch	J at stated temperature	Notched impact response; not identical to fracture toughness or MDMT.

Source / basis: <https://niktrd.com/mechanical-properties>