

Tensile Test Material ID Cheat Sheet

Identify an unknown metal from E, yield and ultimate

ENGINEERING
CHEAT SHEET

Key equations

Quantity	Equation	Notes
Young's modulus	$E = \sigma / \epsilon$	Slope of the linear (elastic) region
Stress	$\sigma = F / A$	A from the average of 6 diameter readings
Reduction in area	$\%RA = (A_o - A_f) / A_o \times 100$	Measured at the neck after fracture; textbook form
Percent error	$ calc - actual / actual \times 100$	Used to match the specimen to a table
Key readings	Yield, ultimate, breaking stress	From the stress-strain diagram

Key takeaways

- Magnet test first: separates the ferrous specimen from the non-ferrous one.
- Strain gauge bonded to each specimen, loaded on a Satec 50UD; one trial each.
- Specimen 1 matched A633 steel; specimen 2 matched aluminum 2014-T6.
- Reference rows: 4130 steel 951 / 1110 MPa; 6061-T6 241 / 300; 2014-T6 414 / 483; A36 250 / 400 (yield / ultimate).
- Error sources named: imperfect gauge bonding, gauge quality, single trial.
- Use steel when strength and stiffness matter; aluminum when weight matters (lower density).

Results reported in the article

Specimen	Property	Calc	Actual	Error
1 (steel)	Stress (MPa)	634	690	8.12%
1 (steel)	E (GPa)	204	207	1.449%
2 (Al 2014-T6)	Stress (MPa)	471	483	2.48%
2 (Al 2014-T6)	E (GPa)	66.9	70	4.42%