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M6–M36 · English · bolt-grade-strength-chart-en

Bolt Strength Grade Chart

Mechanical properties of 7 property classes (4.6–12.9 + stainless A2/A4): proof/tensile/hardness and governing standards, sharing torque chart data.

4.6–12.9 + A2-70/A4-80 · **7 property classes** · **Rp0.2 · Rm · HV** · **ISO 898-1 / ISO 3506-1**

Property Class Mechanical Properties Matrix

Property Class	Proof strength Rp0.2 (MPa)	Tensile strength Rm (MPa)	Vickers hardness HV	Governing standard
4.6	240	400	120–220	ISO 898-1:2013 (GB/T 3098.1-2010)
4.8	340	420	130–220	ISO 898-1:2013 (GB/T 3098.1-2010)
8.8	640	800	250–320	ISO 898-1:2013 (GB/T 3098.1-2010)
10.9	940	1040	320–380	ISO 898-1:2013 (GB/T 3098.1-2010)
12.9	1100	1220	385–435	ISO 898-1:2013 (GB/T 3098.1-2010)
A2-70	450	700	—	ISO 3506-1:2020 (GB/T 3098.6-2014)
A4-80	600	800	—	ISO 3506-1:2020 (GB/T 3098.6-2014)

4.8: ISO 898-1:2013 Table 1 has no Rp0.2 column; value taken as Rpf,min = 340 (footnote e; GB/T 3098.1-2010 Table 2 is identical).

8.8 hardness shown for nominal diameter ≤16 mm (250–320 HV); for d > 16 mm the range is 255–335 HV.

A2-70/A4-80 hardness: not specified for austenitic grades in ISO 3506-1:2009 / GB/T 3098.6-2014 Table 2 (shown as "—"); ISO 3506-1:2020 reference values A2-70: 210–300 HV, A4-80: 250–380 HV.

Calculation Basis

The torque chart family and calculator take grade proof strength Rp0.2 (min) as input and use the K-factor method T = K·D·F with target preload = 70% of Rp0.2 × thread stress area; grade 10.9 proof strength is the ISO 898-1:2013 Table 1 minimum of 940 MPa (corrected by cross-acceptance 2026-08-31).

Boundary: this chart is a quick reference of published standard values; actual product mechanical properties are verified by the manufacturer's test report. Follow the design documents for selection and assembly.

References

- ISO 898-1:2013 — Mechanical properties of fasteners made of carbon and alloy steel — https://www.iso.org/standard/60610.html
- ISO 3506-1:2020 — Corrosion-resistant stainless steel fasteners (A2/A4) — https://www.iso.org/standard/70045.html
- GB/T 3098.1-2010 — Mechanical properties of bolts, screws and studs (free full text) — https://openstd.samr.gov.cn/bzgk/gb/std?std_no=GB%2FT%203098.1-2010
- GB/T 3098.6-2014 — Mechanical properties of stainless steel bolts, screws and studs (free full text) — https://openstd.samr.gov.cn/bzgk/gb/std?std_no=GB%2FT%203098.6-2014

Disclaimer: this chart is a quick reference of engineering estimation and published standard values for selection only. It does not constitute assembly instructions or acceptance criteria.

Bolt Strength Grade Chart — Yaxiio full-range reference PDF, pack v1 · generated 2026-09-25 · data source: yaxiio-customer/utils/fastenerCalc.ts (single source of truth) · methodology matches the online tool pages · https://www.yaxiio.com/en/tools/bolt-grade-strength-chart