

Metric Fastener Property Classes — ISO 898-1 Bolts (4.6 to 12.9), ISO 898-2 Nuts and ISO 3506 Stainless (A2-70, A4-80)

cBallast Technical Sourcing · Carbon-steel, alloy-steel and stainless-steel fasteners · issued 2026-09-15 · cballast.com/documents/metric-fastener-property-classes-iso-898-iso-3506

Property classes of metric fasteners with the numbers behind the marking: nominal and minimum tensile strength, yield or 0.2 % proof stress, proof stress, Vickers hardness range and typical material for classes 4.6, 4.8, 5.6, 5.8, 6.8, 8.8, 9.8, 10.9 and 12.9 (ISO 898-1); matching nut classes 4 to 12 and thin-nut classes 04/05 (ISO 898-2); stainless steel groups A1–A5 with property classes 50, 70 and 80 (ISO 3506-1); how to read the head marking; and a proof-load table for 8.8, 10.9 and 12.9 from M5 to M36.

Metric Fastener Property Classes — ISO 898-1 Bolts (4.6 to 12.9), ISO 898-2 Nuts and ISO 3506 Stainless (A2-70, A4-80)

Catalogue data and standard-part designations in this guide follow the cBallast C-Parts range, supplied through Bufab (Värnamo, Sweden). Values are nominal reference data; confirm against the controlling standard revision before procurement.

The two figures in a metric property class encode the mechanical properties: the first figure $\times 100$ is the nominal tensile strength in MPa, and the two figures multiplied together $\times 10$ is the nominal yield (or 0.2 % proof) stress. A class 8.8 bolt therefore has a nominal tensile strength of 800 MPa and a yield of 640 MPa; class 10.9 is 1000 / 900 MPa. ISO 898-1 sets minimum values slightly above nominal for most classes and, for 8.8, distinguishes threads up to M16 from larger sizes. Nuts are classed by the highest bolt class they can be loaded with (ISO 898-2), and stainless fasteners use a different scheme entirely (ISO 3506-1: steel group A2/A4 plus property class 50/70/80).

Class | Rm nominal / min (MPa) | Yield ReL or Rp0.2 min (MPa) | Proof stress Sp (MPa) | Hardness HV (min–max) | Typical material / heat treatment |

4.6 | 400 / 400 | 240 | 225 | 120 – 220 | Low- or medium-carbon steel, not heat treated |

4.8 | 400 / 420 | 340 (Rp0.2) | 310 | 130 – 220 | Low- or medium-carbon steel, cold worked |

5.6 | 500 / 500 | 300 | 280 | 155 – 220 | Medium-carbon steel |

5.8 | 500 / 520 | 420 (Rp0.2) | 380 | 160 – 220 | Low- or medium-carbon steel, cold worked |

6.8 | 600 / 600 | 480 (Rp0.2) | 440 | 190 – 250 | Medium-carbon steel, cold worked |

8.8 ("d M16) | 800 / 800 | 640 | 580 | 250 – 320 | Medium-carbon or boron steel, quenched and tempered |

8.8 (> M16) | 800 / 830 | 660 | 600 | 255 – 335 | Medium-carbon, boron or alloy steel, quenched and tempered |

9.8 | 900 / 900 | 720 | 650 | 290 – 360 | Medium-carbon or boron steel, quenched and tempered |

10.9 | 1000 / 1040 | 940 | 830 | 320 – 380 | Alloy or boron steel, quenched and tempered |

12.9 | 1200 / 1220 | 1100 | 970 | 385 – 435 | Alloy steel, quenched and tempered |

Proof load of the bolt (kN) — 8.8 / 10.9 / 12.9

Proof load = proof stress Sp $\times$ tensile stress area As. The bolt must carry this load without permanent set. Values below are rounded from ISO 898-1 (Sp 580 MPa for 8.8 up to M16, 600 MPa above M16; 830 MPa for 10.9; 970 MPa for 12.9). M5 8.8: 8.2 kN · 10.9: 11.8 · 12.9: 13.8. M6: 11.7 / 16.7 / 19.5. M8: 21.2 / 30.4 / 35.5. M10: 33.6 / 48.1 / 56.3. M12: 48.9 / 70.0 / 81.8. M14: 66.7 / 95.5 / 112. M16: 91.1 / 130 / 152. M18: 115 / 159 / 186. M20: 147 / 203 / 238. M22: 182 / 251 / 294. M24: 212 / 293 / 342. M27: 275 / 381 / 445. M30: 337 / 466 / 544. M36: 490 / 678 / 792. Tensile stress areas As used: M5 14.2, M6 20.1, M8 36.6, M10 58.0, M12 84.3, M14 115, M16 157, M18 192, M20 245, M22 303, M24 353, M27 459, M30 561, M36 817 mm².

Nut classes (ISO 898-2)

Full-height nuts — classes 4, 5, 6, 8, 10, 12. The class number is the highest bolt class (first figure) the nut can be fully loaded with: class 8 nuts for 8.8 bolts, class 10 for 10.9, class 12 for 12.9. A class 8 nut on a 10.9 bolt limits the joint to 8.8 performance and risks thread stripping before the bolt yields.

Thin nuts (m "H 0.5 d) — classes 04 and 05 (ISO 4035 / DIN 439). The leading zero flags reduced load-bearing capacity; they are for locking or low-load positioning, not for carrying the bolt's proof load.

Prevailing-torque nuts — ISO 7040 (nylon insert, class 8/10), ISO 7042 (all-metal, class 8/10/12), ISO 10511 (thin nylon insert). Class rules are the same as plain nuts; nylon-insert types are limited to about 120 °C.

Style 1 vs style 2 — ISO 4032 style 1 is the normal height (m "H 0.9 d); style 2 (ISO 4033) is taller ("H 1.0 d) and used where a class 9 nut is needed without heat treatment.

Stainless steel (ISO 3506-1)

Designation = steel group + property class, e.g. A2-70 or A4-80. Groups: A1 (free-machining austenitic, lower corrosion resistance), A2 (18/8 austenitic, EN 1.4301/1.4307 type — general atmospheric and food service), A3 (stabilised A2), A4 (austenitic with 2–3 % molybdenum, EN 1.4401/1.4404 type — chloride, marine and process service), A5 (stabilised A4). Property classes: 50 = soft/annealed, Rm "e 500 MPa, Rp0.2 "e 210 MPa; 70 = cold worked, Rm "e 700, Rp0.2 "e 450 (standard for "d M20; above M20 and for fine threads the class 50 values apply unless agreed); 80 = high-strength cold worked, Rm "e 800, Rp0.2 "e 600 ("d M20). Proprietary grades such as BUMAX 88 / 109 reach 8.8- and 10.9-equivalent strength in A4 material. The 2020 edition of ISO 3506-1 also introduced duplex (D grades) and martensitic/ferritic groups; specify the edition when it matters.

Reading the marking

Bolts "e M5 in classes 8.8 and above must be marked with the property class and the manufacturer's identification mark on the head (ISO 898-1); hex socket screws carry the marking on the head top or side. Lower classes may be marked.

Nuts — class number (8, 10, 12) and manufacturer mark on the bearing face or a side face; ISO 898-2 also allows a clock-face code of dots and a bar.

Stainless — steel group and class, e.g. "A2-70", plus manufacturer mark; "e M5.

No marking on a supposed 8.8 or 10.9 bolt is a rejection criterion in a controlled purchasing system; unmarked high-strength fasteners cannot be traced to a batch or a mechanical test.

Selecting a class

Class 8.8 is the general-purpose structural and machine-building bolt in Europe and pairs with class 8 nuts. Class 10.9 gives about 45 % more preload for the same size and is the default for highly loaded, fatigue-critical joints (engines, gearboxes, HV-type structural connections), at the price of stricter corrosion-protection choices because of hydrogen-embrittlement risk above 320 HV. Class 12.9 is reserved for socket head cap screws and special joints; it should not be hot-dip galvanised or electroplated without a qualified process, and its lower ductility makes it unsuitable for joints with impact loading. Below 8.8 (4.6, 4.8, 5.8) is for non-structural, shear-only or low-load applications and for parts that must yield rather than fracture.

Browse the C-Parts range · Bufab · Related: fastener standards cross-reference · torque wrench calibration (ISO 6789) · ASTM A193 B7 stud bolts.

Frequently asked questions

What does property class 4.6 mean? Nominal tensile 400 N/mm² with yield at 60 % of that (240 N/mm²) — the first figure is tensile/100, the second the yield ratio ×10. How strong is class 4.8 compared with 4.6? Same 400 N/mm² tensile family, but cold-worked: 4.8 yields around 340 N/mm² (Rp0.2) against 240 for 4.6 — stiffer preload from the same nominal strength. Where do stainless classes A2-70 and A4-80 fit? ISO 3506: the -70 means 700 N/mm² tensile (450 proof) and -80 means 800 (600 proof) — between carbon classes 5.8/8.8 in strength, chosen for corrosion, not strength.

Part numbers and designations are those of the original manufacturers and are given for identification. cBallast is an independent supplier. © cBallast 2026 · cballast.com