

Property Class 12.9 Metric Bolts (ISO 898-1 / ASTM F568M) — Material Data Sheet

ISO 898-1 / ASTM F568M Class 12.9 · Alloy steel, quenched and tempered
Metric quenched-and-tempered alloy bolting, 1220 MPa

The strongest standard metric class: alloy steel at 1220 MPa (177 ksi) tensile and 1100 MPa yield, 38 to 44 HRC — the socket head cap screw class, equivalent to A574 in inches.

TENSILE	1220 MPa (177 ksi) min	HARDNESS	38–44 HRC
YIELD	1100 MPa min	CARBON	0.31–0.65 %, alloy steel only
PROOF LOAD	970 MPa	MATCHING NUT	Class 12 (ISO 898-2)

Nominal composition

■ Fe balance ~ 99.5% ■ C, P, S trace

Midpoints of the specification ranges, for orientation only. Limits are in the table.

Chemical composition — ASTM F568M Class 12.9 (product analysis)

Element	Symbol	Min %	Max %
Carbon	C	0.31	0.65
Phosphorus	P	—	0.045
Sulfur	S	—	0.045
Alloying elements	—	required	—

Values per ASTM F568M Table 1 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Physical properties (typical)

DENSITY	0.284 lb/in ³ (7.85 g/cm ³)
MODULUS OF ELASTICITY	29.0 × 10 ⁶ psi (200 GPa)
THERMAL EXPANSION (68–212 °F)	6.5 µin/in·°F
MAGNETIC	Yes

Heat treatment

Quenched in oil from above the transformation temperature and tempered at 380 °C (715 °F) minimum, with fine-grain alloy steel that reaches about 90 percent martensite at the centre. Decarburization and carburization of the thread surface are controlled. Plated parts are baked.

Mechanical properties — ASTM F568M Class 12.9

Property class and size	Proof load (MPa)	Tensile strength, min (MPa)	Yield strength, min (MPa)	Elongation, min (%)	Hardness
12.9 — M1.6 to M100	970	1220	1100	8	C38–C44

Values per ASTM F568M Table 3 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. Proof load and tensile loads by thread size are in Table 5 of the specification.

Applicable standards

ISO 898-1	Mechanical properties of carbon and alloy steel bolts, screws and studs
ASTM F568M	Carbon and alloy steel externally threaded metric fasteners
ISO 4762 / DIN 912	Metric socket head cap screw dimensions
ASTM A574	Inch equivalent socket head cap screws

Forms we supply in Class 12.9

- Hex and heavy hex bolts and cap screws
- Studs and threaded rod
- Nuts and washers to match
- Machined specials to drawing

Typical applications

- Socket head cap screws for tooling, dies and machinery
- Engine, gearbox and driveline bolting
- Hydraulic manifolds and high-pressure connections
- Racing and high-performance hardware