

Property Class 10.9 Metric Bolts (ISO 898-1 / ASTM F568M) — Material Data Sheet

ISO 898-1 / ASTM F568M Class 10.9 · Medium-carbon alloy steel, quenched and tempered
Metric quenched-and-tempered alloy bolting, 1040 MPa

The metric Grade 8: alloy steel quenched and tempered to 1040 MPa (150 ksi) tensile and 940 MPa yield, 33 to 39 HRC — equivalent to A354 BD and A490 in the inch system.

TENSILE	1040 MPa (150 ksi) min	HARDNESS	33–39 HRC
YIELD	940 MPa min	TEMPERING	425 °C min (340 °C for low-carbon martensite)
PROOF LOAD	830 MPa	MATCHING NUT	Class 10 (ISO 898-2 / A563M)

Nominal composition

■ Fe balance ~ 99.2% ■ C, C, P, S trace

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

Chemical composition — ASTM F568M Class 10.9 (product analysis)

Element	Symbol	Min %	Max %
Carbon (medium-carbon alloy steel)	C	0.20	0.55
Carbon (medium-carbon steel, M5–M20)	C	0.25	0.55
Phosphorus (alloy steel)	P	—	0.040
Sulfur (alloy steel)	S	—	0.045
Alloying elements	—	required for the full size range	—

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 425 °C (800 °F) minimum; the steel must reach about 90 percent martensite at the centre one diameter from the thread end. Plated parts are baked for hydrogen relief.

Mechanical properties — ASTM F568M Class 10.9

Property class and size	Proof load (MPa)	Tensile strength, min (MPa)	Yield strength, min (MPa)	Elongation, min (%)	Hardness
10.9 — M5 to M100	830	1040	940	9	C33–C39
10.9.3 weathering — M16 to M36	830	1040	940	9	C33–C39

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 898-2 / ASTM A563M CLASS 10	Matching nuts
ISO 10683	Zinc-flake coatings, the usual finish for 10.9

Forms we supply in Class 10.9

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

Typical applications

- Heavy machinery, mining and construction equipment
- Wind-turbine tower and blade bolting
- Metric structural connections (with EN 14399 assemblies)
- Driveline, suspension and engine bolting
- High-strength studs and tie rods