

SAE Grade 5 / ASTM A449 Bolts (120 ksi) — Material Data Sheet

ASTM A449 Type 1 · SAE J429 Grade 5 · Medium-carbon or alloy steel, quenched and tempered

Quenched-and-tempered medium-carbon steel bolting, 120 ksi

The everyday high-strength bolt: quenched and tempered medium-carbon steel at 120 ksi to 1 in., stepping down for larger sizes — Grade 5 in SAE terms, A449 in ASTM terms.

TENSILE, ¼–1 IN.	120 ksi min	HARDNESS, ¼–1 IN.	25–34 HRC
TENSILE, OVER 1–1½ IN.	105 ksi min	HEAD MARKING	Three radial lines (Grade 5) · A449
TENSILE, OVER 1½–3 IN.	90 ksi min	MATCHING NUT	A563 B hex (<=1½ in. plain) · A heavy hex (over 1½ in. plain) · DH heavy hex (zinc coated)

Nominal composition

■ Fe balance ~ 98.7% ■ Mn ~ 0.60% ■ C, P, S, Si trace

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

Chemical composition — ASTM A449 Type 1, carbon steel (heat analysis)

Element	Symbol	Min %	Max %
Carbon	C	0.30	0.52
Manganese	Mn	0.60	—
Phosphorus	P	—	0.040
Sulfur	S	—	0.050
Silicon	Si	0.15	0.30

Values per ASTM A449-14 (2020) Table 1 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. Boron, alloy and alloy-boron steels are also permitted with the same carbon range.

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 liquid from above the transformation temperature and tempered at 800 °F minimum. Threads may be rolled, cut or ground.

Mechanical properties — ASTM A449 Type 1 (machined specimens) and hardness

Grade / condition and size	Tensile strength, min (ksi)	Yield or proof, min (ksi)	Elongation, min (%)	Reduction of area, min (%)	Hardness
¼ to 1 in.	120	92	14	35	25–34 HRC
Over 1 to 1½ in.	105	81	14	35	19–30 HRC
Over 1½ to 3 in.	90	58	14	35	183–235 HBW

Values per ASTM A449-14 (2020) Tables 3 and 6 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. Full-size tensile and proof loads by thread size are in Tables 4 and 5 of the specification.

Applicable standards

ASTM A449	Hex cap screws, bolts and studs, steel, heat treated, 120/105/90 ksi minimum tensile
SAE J429 GRADE 5	Automotive and machinery designation for the same 120 ksi product
ASTM A563	Matching carbon and alloy steel nuts
ASME B18.2.1	Hex cap screw and bolt dimensions

Forms we supply in Grade 5 / A449

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

Typical applications

- Machinery, equipment and vehicle bolting
- Pipe supports and equipment anchoring
- General high-strength fasteners where A325 dimensions are not required
- Studs and threaded rod in 120 ksi