

4142 Alloy Steel (UNS G41420) — Material Data Sheet

ASTM A322 / A434 alloy steel bar · UNS G41420 · AISI/SAE 4142

Chromium-molybdenum alloy steel, slightly higher carbon than 4140

4140's higher-carbon sibling: the same chromium-molybdenum steel with 0.40 to 0.45 percent carbon for a little more hardenability and strength in large sections — quenched and tempered to A434 Class BB, BC or BD.

TENSILE, A434 CLASS BB ($\leq 1\frac{1}{2}$ IN.)	110 ksi min	CARBON	0.40–0.45 %
TENSILE, CLASS BC ($\leq 1\frac{1}{2}$ IN.)	130 ksi min	CHROMIUM · MOLYBDENUM	0.80–1.10 · 0.15–0.25 %
TENSILE, CLASS BD ($\leq 1\frac{1}{2}$ IN.)	155 ksi min	PRESSURE-BOLTING RELATIVE	ASTM A193 B7

Nominal composition

■ Fe balance ~ 97.3%
 ■ Cr ~ 0.95%
 ■ Mn ~ 0.88%
 ■ C, P, S, Si, Mo trace

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

Chemical composition — 4142 (UNS G41420)

Element	Symbol	Min %	Max %
Carbon	C	0.40	0.45
Manganese	Mn	0.75	1.00
Phosphorus	P	—	0.035
Sulfur	S	—	0.040
Silicon	Si	0.15	0.35
Chromium	Cr	0.80	1.10
Molybdenum	Mo	0.15	0.25

Values per ASTM A322-13 (2018) Table 1 (verified against the specification).

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 μ in/in·°F
MAGNETIC	Yes

Heat treatment

Normalize at 1600 to 1700 °F. Harden by austenitizing at 1525 to 1600 °F, oil quench, and temper 800 to 1200 °F to the class or hardness required. Stress relieve after straightening.

Mechanical properties — 4142

Condition and nominal diameter (in.)	Tensile strength, min (ksi)	Yield strength 0.2% offset, min (ksi)	Elongation, min (%)	Reduction of area, min (%)	Hardness
Class BB — 1½ and under	110	90	20	50	—
Class BB — over 1½ to 2½	105	80	20	50	—
Class BB — over 2½ to 4	100	75	20	50	—
Class BB — over 4 to 7	95	75	20	50	—
Class BB — over 7 to 10	90	65	18	40	—
Class BC — 1½ and under	130	110	16	50	—
Class BC — over 1½ to 2½	125	105	16	50	—
Class BC — over 2½ to 4	115	95	16	45	—
Class BC — over 4 to 7	110	85	16	45	—
Class BC — over 7 to 10	105	80	15	40	—
Class BD — 1½ and under	155	130	14	35	—
Class BD — over 1½ to 2½	150	120	14	35	—
Class BD — over 2½ to 4	140	110	14	35	—
Class BD — over 4 to 7	135	105	14	35	—
Class BD — over 7 to 10	130	100	14	35	—

Values per ASTM A434/A434M-18 Table 1 for the 4100 series, quenched and tempered (verified against the specification). Yield is 0.2 % offset; elongation in 2 in.

Applicable standards

ASTM A322	Hot-wrought alloy steel bars
ASTM A434	Quenched and tempered alloy steel bars (Classes BB, BC, BD)
ASTM A29 / SAE J404	Chemical composition of alloy steel bars
ASTM A193 GRADE B7	Chromium-molybdenum bolting for high-temperature service

Forms we supply in 4142

- Machined components from certified bar
- Studs, threaded rod and U-bolts
- Hex bolts and cap screws
- Nuts, washers and spacers
- Pins, shafts and bushings

Typical applications

- Shafts, spindles and axles
- High-strength studs, bolts and tie rods
- Gears, sprockets and couplings
- Hydraulic components and tooling
- Heavy-section machinery parts where 4140 falls short on hardenability