

ASTM A193 Grade B5 — Material Data Sheet

ASTM A193 / ASME SA-193 · UNS S50100 · AISI 501 (5 Cr – ½ Mo)

5 percent chromium-molybdenum steel, quenched and tempered

5 Cr-½ Mo bolting for hot, sulfur-bearing refinery service — the grade that matches P5 piping and furnace hardware.

TENSILE (<=4 IN.)	100 ksi min	HEAT TREATMENT	Q&T, 1100 °F min temper
YIELD (<=4 IN.)	80 ksi min	COMPANION NUT	ASTM A194 3
HARDNESS	No maximum specified	TYPICAL SERVICE	Up to 1100 °F

Nominal composition

■ Fe balance ~ 93.3% ■ Cr ~ 5.00% ■ Mo ~ 0.53% ■ Mn ~ 0.50% ■ Si ~ 0.50% ■ C, P, S trace

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

Chemical composition — ASTM A193 B5 (AISI 501, UNS S50100)

Element	Symbol	Min %	Max %
Carbon	C	0.10	—
Manganese	Mn	—	1.00
Phosphorus	P	—	0.040
Sulfur	S	—	0.030
Silicon	Si	—	1.00
Chromium	Cr	4.0	6.0
Molybdenum	Mo	0.40	0.65

Values per ASTM A193/A193M-24, Tables 1 and 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Physical properties (typical)

DENSITY	0.283 lb/in ³ (7.83 g/cm ³)
MODULUS OF ELASTICITY	29.0 × 10 ⁶ psi (200 GPa)
MAGNETIC	Yes (ferromagnetic)

Heat treatment

Quenched in liquid and tempered at 1100 °F (593 °C) minimum, after all machining and threading.

Mechanical properties — ASTM A193 B5

Nominal diameter (in.)	Tensile strength, min (ksi)	Yield strength 0.2% offset, min (ksi)	Elongation in 4D, min (%)	Reduction of area, min (%)	Hardness, max
4 and under	100	80	16	50	Not specified

Values per ASTM A193/A193M-24, Tables 1 and 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Applicable standards

ASTM A193 / ASME SA-193	Alloy-steel and stainless steel bolting for high-temperature or high-pressure service
ASTM A194 GRADE 3	Companion 5 Cr-Mo heavy hex nuts
ASME B31.3 / API 570	Refinery process piping
ASME B16.5 / B16.47	Flange bolting — stud bolt lengths and quantities

Forms we supply in A193 B5

- Full-thread studs and stud bolts
- Double-end and tap-end studs
- Hex and heavy hex bolts
- Socket head cap screws
- Threaded rod (cut and rolled thread)
- Machined components from certified bar

Typical applications

- Refinery furnace and heater bolting
- 5 Cr (P5) piping flanges
- Hydrotreater, hydrocracker and coker units
- High-temperature sulfur-bearing hydrocarbon service
- Valve bonnets on hot Cr-Mo lines