

ASTM A194 Grade 3 — Material Data Sheet

ASTM A194 / ASME SA-194 · UNS S50100 · AISI 501 (5 Cr – ½ Mo)
5 percent chromium-molybdenum steel nut, quenched and tempered

The 5 Cr-Mo heavy hex nut for A193 B5 studs — matched corrosion behaviour on hot, sulfur-bearing refinery lines.

PROOF LOAD STRESS	175 ksi heavy hex · 150 ksi hex	PATTERN	Heavy hex (ASME B18.2.2)
HARDNESS	248–327 HBW / 24–35 HRC	COMPANION STUD	ASTM A193 B5
HEAT TREATMENT	Q&T, 1050 °F min temper	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 A194 Grade 3 (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 A194/A194M-24, Tables 1, 2 and 5 (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

Liquid quenched and tempered at 1050 °F (565 °C) minimum.

Mechanical properties — ASTM A194 Grade 3

Nut style and size (in.)	Proof load stress (ksi)	Hardness, min	Hardness, max
Heavy hex, all sizes	175	248 HBW / 24 HRC	327 HBW / 35 HRC
Hex (finished pattern), all sizes	150	248 HBW / 24 HRC	327 HBW / 35 HRC

Values per ASTM A194/A194M-24, Tables 1, 2 and 5 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Applicable standards

ASTM A194 / ASME SA-194	Nuts for bolts for high-pressure or high-temperature service
ASTM A193 GRADE B5	Companion studs
ASME B18.2.2	Heavy hex nut dimensions

Forms we supply in A194 3

- Heavy hex nuts (the default for pressure bolting)
- Finished hex nuts
- Jam nuts
- Custom and special nuts to drawing

Typical applications

- Refinery furnace and heater bolting with B5
- 5 Cr (P5) piping flanges
- Hydroprocessing and coker units