

ASTM A194 Grade 7M — Material Data Sheet

ASTM A194 / ASME SA-194 · UNS G41400 · G41420 · G41450 · AISI 4140 · 4142 · 4145

Chromium-molybdenum alloy steel nut, quenched and tempered to controlled hardness

Controlled-hardness Cr-Mo nut for sour service at temperature — 235 HBW max, NACE MR0175, for B7M and L7M studs.

PROOF LOAD STRESS	150 ksi heavy hex · 135 ksi hex	PATTERN	Heavy hex (ASME B18.2.2)
HARDNESS	159–235 HBW / 84–99 HRB	COMPANION STUD	ASTM A193 B7M / A320 L7M
HEAT TREATMENT	Q&T, 1150 °F min temper	SOUR SERVICE	NACE MR0175 / ISO 15156

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 — ASTM A194 Grade 7M (Cr-Mo, AISI 4140/4142/4145)

Element	Symbol	Min %	Max %
Carbon	C	0.38	0.48
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 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	0.284 lb/in ³ (7.85 g/cm ³)
MODULUS OF ELASTICITY	29.7 × 10 ⁶ psi (205 GPa)
THERMAL EXPANSION (68–212 °F)	6.8 µin/in·°F
MAGNETIC	Yes (ferromagnetic)

Heat treatment

Quenched in liquid and tempered at 1150 °F (620 °C) minimum. Hardness verified on every nut.

Mechanical properties — ASTM A194 Grade 7M

Nut style and size (in.)	Proof load stress (ksi)	Hardness, min	Hardness, max
Heavy hex, all sizes	150	159 HBW / 84 HRB	235 HBW / 99 HRB
Hex (finished pattern), all sizes	135	159 HBW / 84 HRB	235 HBW / 99 HRB

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. 100 percent hardness testing; final stress relief after machining at not less than 50 °F below the original tempering temperature (1200 °F minimum in a furnace after an induction temper above 1300 °F).

Applicable standards

ASTM A194 / ASME SA-194	Nuts for bolts for high-pressure or high-temperature service
NACE MR0175 / ISO 15156	Materials for use in H2S-containing environments
ASTM A193 B7M / A320 L7M	Companion studs
ASME B18.2.2	Heavy hex nut dimensions

Forms we supply in A194 7M

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

Typical applications

- Hot sour service flange bolting
- Sour gas wellheads and process units
- Hydrotreater and sulfur recovery bolting
- Any Grade 7 application requiring NACE compliance