

ASTM A194 Grade 6 (410 Stainless) — Material Data Sheet

ASTM A194 / ASME SA-194 · UNS S41000 · AISI 410 (6F: AISI 416)

Martensitic 12 percent chromium stainless nut, hardened and tempered

The 410 stainless heavy hex nut for A193 B6 studs — hardened and tempered, 20 to 28 HRC, for valve and steam service.

PROOF LOAD STRESS	150 ksi heavy hex · 135 ksi hex	PATTERN	Heavy hex (ASME B18.2.2)
HARDNESS	228–271 HBW / 20–28 HRC	COMPANION STUD	ASTM A193 B6
HEAT TREATMENT	Quenched (liquid or inert gas) and tempered at 1100 °F min	MAGNETIC	Yes

Nominal composition



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

Chemical composition — ASTM A194 Grade 6 (AISI 410, UNS S41000)

Element	Symbol	Min %	Max %
Carbon	C	0.08	0.15
Manganese	Mn	—	1.00
Phosphorus	P	—	0.040
Sulfur	S	—	0.030
Silicon	Si	—	1.00
Chromium	Cr	11.5	13.5

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	0.280 lb/in ³ (7.75 g/cm ³)
MODULUS OF ELASTICITY	29.0 × 10 ⁶ psi (200 GPa)
THERMAL EXPANSION (68–212 °F)	5.5 µin/in·°F
MAGNETIC	Yes (ferromagnetic)

Heat treatment

Austenitized, quenched in liquid or inert gas, and tempered at 1100 °F (595 °C) minimum for at least 1 hour (A194 clause 6.4). Grade 6F (Type 416 / 416Se) is heat treated to the same hardness window.

Mechanical properties — ASTM A194 Grade 6 and 6F

Nut style and size (in.)	Proof load stress (ksi)	Hardness, min	Hardness, max
Heavy hex, all sizes	150	228 HBW / 20 HRC	271 HBW / 28 HRC
Hex (finished pattern), all sizes	135	228 HBW / 20 HRC	271 HBW / 28 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. Grade 6F (Type 416 / 416Se) has the same mechanical requirements. Tempered for at least 1 h. Grade 6F chemistry per Table 1: C 0.15 max, Mn 1.25 max, P 0.060 max, S 0.15 min (416) or S 0.060 max with Se 0.15 min (416Se), Si 1.00 max, Cr 12.0–14.0.

Applicable standards

ASTM A194 / ASME SA-194	Nuts for bolts for high-pressure or high-temperature service
ASTM A193 GRADE B6 / B6X	Companion studs
ASME B18.2.2	Heavy hex nut dimensions

Forms we supply in A194 6

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

Typical applications

- Valve bonnet and trim nuts with B6
- Steam turbine and steam piping hardware
- Pump and compressor bolting in mildly corrosive service