

410 Stainless Steel (UNS S41000) — Material Data Sheet

ASTM A276 bar · ASTM F593 bolts · UNS S41000 · AISI 410

Hardenable 12 percent chromium martensitic stainless steel

The basic hardenable stainless: 12 percent chromium, heat treatable to 120 ksi and beyond, magnetic, and corrosion resistant in mild atmospheres — for valve trim, pump parts and high-strength stainless bolts.

TENSILE, ANNEALED BAR	70 ksi min	BOLTS, F593 HT	160–190 ksi
TENSILE, CONDITION T	100 ksi min	MAGNETIC	Yes
TENSILE, CONDITION H	120 ksi min	PRESSURE-FLANGE GRADE	ASTM A193 B6

Nominal composition

■ Fe balance ~ 86.3% ■ Cr ~ 12.50% ■ 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 — Type 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 A276/A276M-17 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	0.280 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 (martensitic)

Heat treatment

Annealed at about 1500 to 1650 °F. Hardened by austenitizing at 1700 to 1850 °F, oil or air quenching, and tempering: 1050 °F and above for Condition T / F593 H (best toughness and corrosion resistance), 525 to 700 °F for Condition H / F593 HT (maximum strength; F593 sets 525 °F as the minimum HT temper). Tempering between 700 and 1050 °F is avoided because toughness and corrosion resistance both fall.

Bar properties — ASTM A276 Type 410

Condition and nominal diameter (in.)	Tensile strength, min (ksi)	Yield strength 0.2% offset, min (ksi)	Elongation, min (%)	Reduction of area, min (%)	Hardness
Condition A (annealed), hot finished — all	70	40	20	45	—
Condition A, cold finished — all	70	40	16	45	—
Condition T (tempered high), hot finished — all	100	80	15	45	—
Condition T, cold finished — all	100	80	12	40	—
Condition H (tempered low), hot finished — all	120	90	12	40	—
Condition H, cold finished — rounds	120	90	12	40	—

Values per ASTM A276/A276M-17 Tables 1 and 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Bolt and stud properties — ASTM F593 Alloy Group 5 (410, 416, 416Se)

F593 condition · marking	Nominal diameter (in.)	Tensile strength (ksi)	Yield strength, min (ksi)	Rockwell hardness
H (hardened, tempered >=1050 °F) · F593P	¼ to 1½	110 to 140	90	C20 to C30
HT (hardened, tempered >=525 °F) · F593R	¼ to 1½	160 to 190	120	C34 to C45

Values per ASTM F593-24 Table 2, full-size tests (verified against the specification). Yield is 0.2 % offset; hardness is Rockwell. Machined-specimen limits differ slightly.

Applicable standards

ASTM A276 / A479	Stainless steel bars
ASTM F593	Stainless steel bolts, hex cap screws and studs (Alloy Group 5)
ASTM F594	Stainless steel nuts
ASTM A193 GRADE B6	12-chrome bolting for high-temperature service
ASTM A967	Passivation

Forms we supply in 410 Stainless

- Hex and heavy hex bolts and cap screws
- Full-thread studs and threaded rod
- Socket head cap and set screws
- Hex, jam and lock nuts
- Washers and spacers
- Machined components from certified bar

Typical applications

- Valve stems, trim and seats
- Pump shafts and wear parts
- Steam and fresh-water hardware
- High-strength stainless bolts and studs
- Turbine and compressor components
- Cutlery, tooling and fixtures