

ASTM A574 Alloy Steel Socket Head Cap Screws (170–180 ksi) — Material Data Sheet

ASTM A574 / ASME B18.3 · Alloy steel, quenched and tempered
Alloy steel socket head cap screws, 170 to 180 ksi

The socket head cap screw specification: alloy steel quenched and tempered to 180 ksi in ½ in. and smaller and 170 ksi above, 37 to 44 HRC, black oxide — the standard for tooling, machinery and die work.

TENSILE, ≤½ IN.	180 ksi min	HARDNESS	39–44 HRC (≤½) · 37–44 HRC
TENSILE, >½ IN.	170 ksi min	CARBON	0.33 % min
PROOF LOAD	140 ksi (≤½) · 135 ksi	FINISH	Bright or black oxide (thermal or chemical), at the manufacturer's option

Nominal composition

■ Fe balance ~ 99.6% ■ C, P, S trace

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

Chemical composition — ASTM A574 (heat analysis)

Element	Symbol	Min %	Max %
Carbon	C	0.33	—
Phosphorus	P	—	0.035
Sulfur	S	—	0.040
Alloying elements	—	required	—

Values per ASTM A574-21 Table 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. Alloying elements per the alloy steel definition in 6.2.

Physical properties (typical)

DENSITY	0.284 lb/in ³ (7.85 g/cm ³)
MODULUS OF ELASTICITY	29.0 × 10 ⁶ psi (200 GPa)
THERMAL EXPANSION (68–212 °F)	6.5 µin/in·°F
MAGNETIC	Yes

Heat treatment

Quenched in oil from above the transformation temperature and tempered at 700 °F minimum (A574 clause 5.4). Screws through 0.625 in. diameter and 4 in. long are roll threaded unless otherwise specified; larger sizes are rolled, cut or ground at the manufacturer's option.

Mechanical properties — ASTM A574 socket head cap screws

Grade / condition and size	Tensile strength, min (ksi)	Yield or proof, min (ksi)	Elongation, min (%)	Reduction of area, min (%)	Hardness
½ in. and smaller (full size)	180	140 proof	—	—	39–44 HRC
Over ½ to 1 in. (full size)	170	135 proof	—	—	37–44 HRC
1 in. and larger (machined specimen)	170	153 yield	10	35	37–44 HRC

Values per ASTM A574-21 Table 1 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Applicable standards

ASTM A574	Alloy steel socket head cap screws
ASME B18.3	Socket cap, shoulder and set screw dimensions
ASTM F835	Alloy steel socket button and flat countersunk head cap screws
ASTM F912	Alloy steel socket set screws

Forms we supply in A574

- Hex and heavy hex bolts and cap screws
- Studs and threaded rod
- Nuts and washers to match
- Machined specials to drawing

Typical applications

- Tooling, dies and fixtures
- Machinery and machine-tool assembly
- Hydraulic manifolds and valve bodies
- High-strength fasteners in confined spaces