

ASTM F912 Alloy Steel Socket Set Screws — Material Data Sheet

ASTM F912 · ASME B18.3 · Alloy steel, quenched and tempered

Alloy steel socket set screws, 45 to 53 HRC

The socket set screw specification: alloy steel through hardened to 45 to 53 HRC, torque tested rather than tensile tested, with cup, flat, cone, oval and half-dog points — black oxide finished.

HARDNESS	45–53 HRC	TORSIONAL STRENGTH, 1 IN.	8 000 in·lbf min
TORSIONAL STRENGTH, ¼ IN.	94 in·lbf min	CARBON	0.30–0.48 %
TORSIONAL STRENGTH, ½ IN.	750 in·lbf min	FINISH	Bright or black oxide, 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 F912 (heat analysis)

Element	Symbol	Min %	Max %
Carbon	C	0.30	0.48
Phosphorus	P	—	0.035
Sulfur	S	—	0.040
Alloying elements	—	required	—

Values per ASTM F912-11 Table 1 (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	29.0 × 10 ⁶ psi (200 GPa)
THERMAL EXPANSION (68–212 °F)	6.5 µin/in·°F
MAGNETIC	Yes

Heat treatment

Quenched in oil and tempered to 45 to 53 HRC. Controlled-atmosphere heat treatment to limit decarburization at the point and socket.

Torsional strength — ASTM F912 socket set screws (selected sizes)

Nominal size	Test torque, min (in·lbf)	Hardness	—	—	—
#4 (0.112 in.)	6.0	45–53 HRC			
#10 (0.190 in.)	40	45–53 HRC			
¼ in.	94	45–53 HRC			
⅜ in.	317	45–53 HRC			
½ in.	750	45–53 HRC			
¾ in.	2 520	45–53 HRC			
1 in.	8 000	45–53 HRC			
1½ in.	18 100	45–53 HRC			
2 in.	38 000	45–53 HRC			

Values per ASTM F912-11 Table 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. The full table runs from #0 to 2 in.; shortest lengths subject to torque testing depend on the point style.

Applicable standards

ASTM F912	Alloy steel socket set screws
ASME B18.3	Socket set screw dimensions and point styles
ASTM F880	Stainless steel socket set screws

Forms we supply in F912

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

Typical applications

- Collars, couplings and pulleys on shafts
- Gear and sprocket hubs
- Adjustment and stop screws in machinery
- Tooling and fixture locating screws