

Phosphor Bronze C51000 / C54400 — Material Data Sheet

ASTM F468 / F467 fasteners · ASTM B139 rod · UNS C51000 · C54400 · Phosphor bronze 5 % A (Alloy 510) and free-cutting phosphor bronze (Alloy 544)
Copper-tin-phosphorus bronze with high fatigue strength and spring properties

The spring and fatigue bronze — 5 percent tin with phosphorus for elasticity, wear and corrosion resistance; C54400 is the free-machining version.

TENSILE, F468 FULL SIZE	60–90 ksi	NUT PROOF STRESS, F467	60 ksi hex · 65 heavy hex
YIELD, F468	35 ksi min	TIN	4.2–5.8 %
HARDNESS, F468	60–95 HRB	MAGNETIC	No

Nominal composition

■ Cu balance ~ 94.6% ■ Sn ~ 5.00% ■ P, Fe, Zn, Pb trace

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

Chemical composition — C51000 per ASTM F468 Table 1

Element	Symbol	Min %	Max %
Copper	Cu	balance	—
Tin	Sn	4.2	5.8
Phosphorus	P	0.03	0.35
Iron	Fe	—	0.10
Zinc	Zn	—	0.30
Lead	Pb	—	0.05

Values per ASTM F468-23 Table 1 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. C54400 (free-cutting phosphor bronze) adds lead and zinc; consult ASTM B139 for its limits.

Physical properties (typical)

DENSITY	0.320 lb/in ³
MAGNETIC	No
SPARKING	Non-sparking

Heat treatment

Not heat treatable. Supplied in the rod temper ordered; strength is developed by cold work.

Fastener mechanical properties per ASTM F468 Table 2 (marking F468E)

Nominal diameter (in.)	Hardness	Full-size tensile (ksi)	Full-size yield, min (ksi)	Machined tensile, min (ksi)	Machined yield, min (ksi)	Elongation in 4D, min (%)
All sizes	60–95 HRB	60–90	35	55	30	15

Values per ASTM F468-23 Table 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team. Full-size tensile range and yield; machined-specimen minimums in the last three columns.

Nut requirements per ASTM F467 Table 2 (marking F467E)

Nut style	Hardness, min	Proof stress, min (ksi)
Hex and hex flange	60 HRB	60
Heavy hex, large hex flange and thick	60 HRB	65

Values per ASTM F467-24 Table 2 (verified against the specification). Confirm the edition called out on your purchase order with our estimating team.

Applicable standards

ASTM F468 / F468M	Nonferrous bolts, cap screws and studs (Cu 510, F468E)
ASTM F467 / F467M	Nonferrous nuts (Cu 510, F467E)
ASTM B139 / B139M	Phosphor bronze rod, bar and shapes (C51000, C54400)
ASTM B103 / B103M	Phosphor bronze plate, sheet and strip

Forms we supply in C51000 Phosphor Bronze

- Bolts, studs and screws to F468
- Nuts to F467
- Bushings, bearings, gears and wear parts machined from C54400
- Springs and electrical contacts
- Certified B139 rod

Typical applications

- Electrical connectors and spring contacts
- Bushings, bearings and thrust washers
- Pump and valve components in fresh water and mild chemicals
- Fasteners needing fatigue resistance and non-sparking behaviour
- Marine and architectural hardware