C51000

Continuous cast and drawn	
Product description	Phosphor bronze 5% A
Tempers	H04 hard, H08 spring
Solids	3/8" to 2 1/2" O.D.
Hex	3/8" to 2" O.D.
Standard lengths	144" *H04 hard temper is standard stocked

Typical uses

Architecture

Bridge bearing plates

Electrical

Electrical connectors, electrical flexing contact blades, electromechanical spring components, electronic and precision instrument parts, electronic connectors, fuse clips, resistance wire, switch parts, wire brushes

Fasteners

Cotter pins, fasteners, lock washers

Industrial

Beater bar, bellows, bourdon tubes, chemical hardware, clutch disks, diaphragms, perforated sheets, pressure-responsive elements, sleeve bushings, springs, textile machinery, truss wire, welding rods

Similiar or equivalent specification						
CDA	ASTM	SAE	AMS	Federal	Military	Other
C51000	B139 B139M	J461 J463	4625			

Chemical composition					
Cu (%)	Pb (%)	Sn (%)	Zn (%)	Fe (%)	P (%)
Remain	0.05	4.20-5.80	0.30	0.10	0.03-0.35

Chemical composition according to ASTM B139/B139M-12(2017)

Note: Cu + sum of named elements, 99.5% min. Single values represent maximums.

Machinability

Copper alloy UNS no.	Machinability rating	Density (lb/in^3 at 68 $^\circ$ F)
C51000	20	0.320

Mechanical properties

Mechanical properties according to ASTM B139/B139M-12(2017)
C51000
H04 hard

Size range ¼" to ½" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
70	485			13	87	

Size range over ½" to 1" round and hexagonal inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
60	415			15	87	

Size range over 1" round and hexagonal

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
55	380			18	87	

C51000
H08 spring

Size range 0.026" to ½" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
115	790					

C51000 continued

Size range over 1/16" to 1/8" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
110	760					

Size range over 1/8" to 1/4" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
105	725			3.5		

Size range over 1/4" to 3/8" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
100	690			5		

Size range over 3/8" to 1/2" round inclusive

Tensile strength, min		Yield strength, at 0.5% extension under load, min		Elongation, 4x diameter or specimen thickness, min	Rockwell "B" hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
90	620			9	95	

Physical properties

	US customary	Metric
Melting point – liquidus	1920˚F	1049˚C
Melting point – solidus	1750˚F	954˚C
Density	0.32 lb/in³ at 68˚F	8.86 gm/cm³ at 20˚C
Specific gravity	8.86	8.86
Electrical conductivity*	15% IACS at 68˚F	0.088 MegaSiemens/cm at 20˚C
Thermal conductivity	40 Btu/sq ft/ft hr/˚F at 68˚F	69.2 W/m at 20˚C
Coefficient of thermal expansion 68-572	9.9 · 10^{-6} per˚F (68-572˚F)	17.1 · 10^{-6} per˚C (20-300˚C)
Specific heat capacity	0.09 Btu/lb/˚F at 68˚F	377.1 J/kg at 20˚C
Modulas of elasticity in tension	16000 ksi	110310 MPa
Modulas of rigidity	6000 ksi	41370 MPa

Physical properties provided by CDA

**Determined on an alloy containing 5% tin and .2% phosphorus. This value will vary with the composition.*

Fabrication properties

Technique	Suitability
Soldering	Excellent
Brazing	Excellent
Oxyacetylene welding	Fair
Gas shielded arc welding	Good
Coated metal arc welding	Fair
Spot weld	Good
Seam weld	Fair
Butt weld	Excellent
Capacity for being cold worked	Excellent
Capacity for being hot formed	Poor
Machinability rating	20

Fabrication properties provided by CDA

Thermal properties

Treatment	Minimum*	Maximum*
Annealing	900	1250

Thermal properties provided by CDA

**Temperature is measured in Fahrenheit.*

Common fabrication processes

Blanking, drawing, forming and bending, heading and upsetting, roll threading and knurling, shearing, stamping

Common fabrication processes provided by CDA