

C51000 Lead-Free Replacement

Wrought

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.
Rectangles:	Consult Mill
Standard Lengths:	144"

Typical Uses

Architecture	bridge bearing plates
Electrical	resistance wire, fuse clips, electromechanical spring components, electrical flexing contact blades, electrical connectors, electronic connectors, wire brushes, switch parts, electronic and precision instrument parts
Fasteners	fasteners, cotter pins, lock washers
Industrial	bourdon tubes, bellows, perforated sheets, chemical hardware, truss wire, springs, sleeve bushings, diaphragms, clutch disks, pressure responsive elements, beater bar, textile machinery, welding rods

Similar or Equivalent Specification

CDA	ASTM	Asarcon	SAE	AMS	Federal	Military	Other
C51000	B139 B139M		J461 J463	4625			

Chemical Composition

Cu%	Pb%	Sn%	Zn%	Fe%	P%
Rem.	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/cu in at 68 °F)
C51000	20	0.320



Mechanical Properties

C51000 continued

Mechanical Properties according to ASTM B139/B139M-12(2017)(2017)
C51000
H04 Hard

SIZE RANGE: ¼" ROUND AND HEXAGONAL TO ½" INCLUSIVE

Tensile Strength, min		Yield Strength, at .5% Extension Under Load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" Hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
70	485			13	87	

SIZE RANGE: OVER ½" ROUND AND HEXAGONAL TO 1" INCLUSIVE

Tensile Strength, min		Yield Strength, at .5% Extension Under Load, min		Elongation, in 2 in. or 50 mm 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 .5% Extension Under Load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" Hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
55	380			18	87	

C51000
H08 Spring Temper

SIZE RANGE: ¾" TO ½" ROUND

Tensile Strength, min		Yield Strength, at .5% Extension Under Load, min		Elongation, in 2 in. or 50 mm min	Rockwell "B" Hardness	Remarks
ksi	MPa	ksi	MPa	%	typical HRB	
90	620			9	95	



Physical Properties

C51000 continued

	US Customary	Metric
Melting Point – Liquidus	1920 °F	1049 °C
Melting Point – Solidus	1750 °F	954 °C
Density	0.32 lb/in ³ at 68 °F	8.86 gm/cm ³ 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	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
Modulus of Elasticity in Tension	16000 ksi	110310 MPa
Modulus 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

Joining 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

Fabrication Properties provided by CDA

Thermal Properties

Treatment	Temp./Time - US	Temp./Time - SI
Stress Temperature		
Solution Minimum		
Solution Maximum		
Solution Time		
Solution Medium		
Precipitation Value		
Precipitation Time		
Precipitation Medium		
Annealing Minimum	900	483
Annealing Maximum	1250	677
Annealing Time		
Hot Treatment Minimum		
Hot Treatment Maximum		

Thermal Properties provided by CDA

