

Copper-Aluminum-Iron-Nickel Alloy (Aluminum Bronze) C95500

Chemical Composition

(% max., unless shown as range or min.)

	Cu ⁽¹⁾	Pb	Fe	Ni (incl Co)	Al	Mn	Mg	Si	Zn	Sn	Other Named Elements
Min. / Max.	78.0min.	—	3.0-5.0	3.0-5.5	10.0-11.5	3.5	—	—	—	—	—
Nominal	80.0	—	4.0	4.3	11.0	—	—	—	—	—	—

1. Cu + Sum of Named Elements, 99.5% min.

Applicable Specifications

Process or Ingot	Specification	
Centrifugal	ASTM	B 271
	SAE	J461, J462
Continuous	ASTM	B 505
	SAE	J461, J462
Ingot	ASTM	B 30
	INGOT	415D
Precision	ASTM	B 806
Sand	ASTM	B 148, B 763
	SAE	J461, J462

Fabrication Practices

Joining Technique	Suitability
Soldering	Good
Brazing	Fair
Oxyacetylene Welding	Not Recommended
Gas Shielded Arc Welding	Good
Coated Metal Arc Welding	Good

Machinability Rating: 50

(C36000, Free Cutting Brass = 100)

Typical Uses

Bushings
Corrosion and Oxidation Resistant Applications
Landing Gear Parts
Agitators
Gears
Pickling Hooks and Baskets
Worms
Gun Recoil Mechanisms
Valve Guides and Seats in Aircraft Engines

Casting Characteristics

Characteristic	Value
Effect of Section Size	Small
Patternmakers Shrinkage	3/16 in./ft
Drossing	High
Gassing	Medium
Fluidity	Medium
Shrinkage	High
Casting Yield	Low

Heat Treatment

Stress Relieving: 600 F (315 C) for 1h/in. of Section Thickness
Solution Anneal: 1600-1675 F 1h/WQ
Tempering: 1150-1225 F (620-665 C) for 1h/AC

This alloy may be sensitive to water-quench cracking in heavy casting sections. Oil quenching or forced-air cooling may be preferred.

Physical Properties

	US Customary	Metric
Melting Range, Liquidus	1930 F	1054 C
	Solidus	1900 F
Density	0.272 lb/in. ³ at 68 F	7.53 g/cm ³ at 20 C
Specific Gravity	7.53	7.53
Electrical Resistivity	122.8 ohm•cmil/ft at 68 F	20.4 microhm-cm at 20
Coefficient of Thermal Expansion	9.0 10 ⁻⁶ per°F (68-572 F)	16.2 10 ⁻⁶ per°C (20-300 C)
Magnetic Permeability		
As Cast, (F.S.=16kA/m)	1.32	1.32
TQ 50 Temper, Field Strength	1.20	1.20
Thermal Conductivity	24.2 Btu•ft/(hr•ft ² •°F) at 68	41.9 W/m•°K at 20 C
Electrical Conductivity	8 %IACS at 68 F	0.049 Siemens/cm at 20 C
Specific Heat Capacity	0.10 Btu/lb/°F at 68 F	419 J/kg•°K at 20 C
Modulus of Elasticity in Tension	16,000 ksi	110,000 MPa
Poisson's Ratio	0.32	0.32

Mechanical Properties*

M01 - AS SAND CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	90 ksi	620 MPa	ASTM B 148, B 763; SAE J462-A
	Typical	100 ksi	689 MPa	
Yield Strength				
0.5% Ext. under load	Minimum	40 ksi	275 MPa	ASTM B 148, B 763; SAE J462-A
	Typical	44 ksi	303 MPa	
Proportional Limit	Typical	28 ksi	193 MPa	
Elongation	Minimum	6 %, in 2 in.	6 %, in 51 mm	ASTM B 148, B 763; SAE J462-A
	Typical	12 %, in 2 in.	12 %, in 51 mm	
Rockwell Hardness				
B scale	Typical	87	87	
Brinell Hardness				
3000 kg load	Minimum	190	190	ASTM B 148, B 763
	Typical	195	195	
Shear Strength	Typical	48 ksi	331 MPa	
Compressive Strength				
0.1 in. set/in.	Typical	120 ksi	827 MPa	
Impact Strength				
Izod	Typical	13 ft-lb	18 J	
Charpy V-Notch	Typical	10 ft-lb	14 J	
Fatigue Strength				
at 10 ⁸ cycles	Typical	31 ksi	214 MPa	
Creep Strength,				
0.1%/10 ⁴ h				
at 600 F (316 C)	Typical	11 ksi	72 MPa	
at 700 F (371 C)	Typical	6 ksi	38 MPa	
at 800 F (427 C)	Typical	3 ksi	17 MPa	

Mechanical Properties*

<i>M01 / TQ50 - AS SAND CAST, QUENCH HARDENED & TEMPER ANNEALED</i>				
		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	110 ksi	760 MPa	ASTM B 148, B 763; SAE J462-C
	Typical	120 ksi	827 MPa	
Yield Strength				
0.5% Ext. under load	Minimum	60 ksi	415 MPa	ASTM B 148, B 763; SAE J462-C
	Typical	68 ksi	469 MPa	
Proportional Limit	Typical	45 ksi	310 MPa	
Elongation	Minimum	5 %, in 2 in.	5 %, in 51 mm	ASTM B 148, B 763; SAE J462-C
	Typical	10 %, in 2 in.	10 %, in 51 mm	
Brinell Hardness				
3000 kg load	Minimum	200	200	ASTM B 148, B 763
	Typical	230	230	
Shear Strength	Typical	70 ksi	483 MPa	
Compressive Strength				
0.1 in. set/in.	Typical	150 ksi	1034 MPa	
Impact Strength				
Izod	Typical	15 ft-lb	20 J	
Fatigue Strength				
at 10 ⁸ cycles	Typical	38 ksi	262 MPa	

<i>M02 - AS CENTRIFUGAL CAST</i>				
		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	90 ksi	620 MPa	ASTM B 271; SAE J462-A
Yield Strength				
0.5% Ext. under load	Minimum	40 ksi	275 MPa	ASTM B 271; SAE J462-A
Elongation	Minimum	6 %, in 2 in.	6 %, in 51 mm	ASTM B 271; SAE J462-A
Brinell Hardness				
3000 kg load	Minimum	190	190	ASTM B 271

<i>M02 / TQ50 AS CENTRIFUGAL CAST, QUENCH HARDENED & TEMPER ANNEALED</i>				
		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	110 ksi	760 MPa	ASTM B 271; SAE J462-C
Yield Strength				
0.5% Ext. under load	Minimum	60 ksi	415 MPa	ASTM B 271; SAE J462-C
Elongation	Minimum	5 %, in 2 in.	5 %, in 51 mm	ASTM B 271; SAE J462-C
Brinell Hardness				
3000 kg load	Minimum	200	200	ASTM B 271

Mechanical Properties*

M05 - AS PERMANENT MOLD CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	110 ksi	760 MPa	ASTM B 806
	Typical	113 ksi	780 MPa	
Yield Strength 0.5% Ext. under load	Minimum	60 ksi	415 MPa	ASTM B 806
	Typical	62 ksi	430 MPa	
Elongation	Minimum	5 %, in 2 in.	5 %, in 51 mm	ASTM B 806
	Typical	6 %, in 2 in.	6 %, in 51 mm	
Rockwell Hardness				
B scale	Typical	99	99	

M07 - AS CONTINUOUS CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	95 ksi	655 MPa	ASTM B 505; SAE J462-B
Yield Strength 0.5% Ext. under load	Minimum	42 ksi	290 MPa	ASTM B 505; SAE J462-B
	Minimum	42 ksi	290 MPa	
Elongation	Minimum	10 %, in 2 in.	10 %, in 51 mm	ASTM B 505; SAE J462-B

M07/TQ50 - AS CONTINUOUS CAST, QUENCH HARDENED & TEMPER ANNEALED				
		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	110 ksi	758 MPa	ASTM B 505
	Minimum	110 ksi	760 MPa	SAE J462-D
Yield Strength 0.5% Ext. under load	Minimum	62 ksi	427 MPa	ASTM B 505
	Minimum	62 ksi	425 MPa	SAE J462-D
Elongation	Minimum	8 %, in 2 in.	8 %, in 51 mm	ASTM B 505; SAE J462-D

* For alloys listed under SAE J462, suffix symbols are to distinguish between two or more sets of mechanicals properties, heat treatments, conditions, etc., as applicable. See Society of Automotive Engineers Inc., SAE Handbook, Vol. 1 Materials, 1989, Warrendale, PA 15096.