

Copper-Tin Alloy (Tin Bronze) C90300

Chemical Composition

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

	Cu ⁽¹⁾⁽²⁾	Sn	Pb	Zn	Fe	Sb	Ni (incl Co)	S	P ⁽³⁾	Al	Si	Mn
Min./Max.	86.0-89.0	7.5-9.0	.30	3.0-5.0	.20	.20	1.0	.05	.05	.005	.005	—
Nominal	87.5	8.3	—	4.0	—	—	—	—	—	—	—	—

1. Cu + Sum of Named Elements, 99.4% min.

2. In determining Cu min., Cu may be calculated as Cu + Ni.

3. For continuous castings, P shall be 1.5% max.

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	225
Precision	MILITARY	MIL-C-11866
Sand	ASTM	B 584, B 763
	SAE	J461, J462

Fabrication Practices

Joining Technique	Suitability
Soldering	Excellent
Brazing	Good
Oxyacetylene Welding	Fair
Gas Shielded Arc Welding	Fair
Coated Metal Arc Welding	Fair

Machinability Rating: 30

(C36000, Free Cutting Brass = 100)

Typical Uses

Bearings and bushings
Seal Rings
Gears
Piston Rings
Pump Impellers
Steam Fittings
Valve Components

Casting Characteristics

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

Heat Treatment

Stress Relieving: 500 F (260 C) for 1h/in. of Section Thickness
Cannot be Strengthened by Heat Treatment

Physical Properties

	US Customary	Metric
Melting Range, Liquidus	1832 F	1000 C
	Solidus	854 C
Density	0.318 lb/in. ³ at 68 F	8.80 g/cm ³ at 20 C
Specific Gravity	8.80	8.80
Electrical Resistivity	87.2 ohm•cmil/ft at 68 F	14.4 microhm-cm at 20 C
Coefficient of Thermal Expansion	10.0 10 ⁻⁶ per°F (68-392 F)	18.0 10 ⁻⁶ per°C (20-200 C)
Magnetic Permeability (F.S.=16kA/m)	1.00	1.00
Thermal Conductivity	43.2 Btu•ft/(hr•ft ² •°F) at 68 F	74.8 W/m•°K at 20 C
Electrical Conductivity	12 %IACS at 68 F	0.069 Siemens/cm at 20 C
Specific Heat Capacity	0.09 Btu/lb/°F at 68 F	377 J/kg•°K at 20 C
Modulus of Elasticity in Tension	14,000 ksi	96,500 MPa

Mechanical Properties*

M01 - AS SAND CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	40 ksi	276 MPa	ASTM B 584, B 763
	Minimum	40 ksi	275 MPa	SAE J462-A
	Typical	45 ksi	310 MPa	
Yield Strength				
0.5% Ext. under load	Minimum	18 ksi	124 MPa	ASTM B 584, B 763
	Minimum	18 ksi	125 MPa	SAE J462-A
	Typical	21 ksi	145 MPa	
Elongation	Minimum	20 %, in 2 in.	20 %, in 51 mm	ASTM B 584, B 763; SAE J462-A
	Typical	30 %, in 2 in.	30 %, in 51 mm	
Brinell Hardness				
500 kg load	Typical	70	70	
Compressive Strength				
0.001 in. set/in.	Typical	13 ksi	90 MPa	
Impact Strength				
Charpy V-Notch	Typical	14 ft-lb	19 J	

M07 - AS CONTINUOUS CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	44 ksi	303 MPa	ASTM B 505
	Minimum	44 ksi	305 MPa	SAE J462-B
Yield Strength				
0.5% Ext. under load	Minimum	22 ksi	152 MPa	ASTM B 505
	Minimum	22 ksi	150 MPa	SAE J462-B
Elongation	Minimum	18 %, in 2 in.	18 %, in 51 mm	ASTM B 505; SAE J462-B

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