

Copper-Tin Alloy (Tin Bronze) C90700

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.	88.0-90.0	10.0-12.0	.50	.50	.15	.20	.50	.05	.30	.005	.005	—
Nominal	89.0	11.0	—	—	—	—	—	—	—	—	—	—

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 427
	SAE	J461, J462
Continuous	ASTM	B 505
	SAE	J461, J462
Ingot	ASTM	B 30
	INGOT	205
Sand	ASTM	B 427
	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: 20
(C36000, Free Cutting Brass = 100)

Typical Uses

Bearings and Bushings
Gears
Worm Wheels

Casting Characteristics

Characteristic	Value
Effect of Section Size	Large
Patternmakers Shrinkage	3/16 in./ft
Drossing	Low
Gassing	Med-High
Fluidity	High
Shrinkage	Low
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	1830 F	999 C
	Solidus 1528 F	831 C
Density	0.317 lb/in. ³ at 68 F	8.77 g/cm ³ at 20 C
Specific Gravity	8.77	8.77
Electrical Resistivity	107.4 ohm•cmil/ft at 68 F	17.9 microhm-cm at 20 C
Coefficient of Thermal Expansion	10.2 10 ⁻⁶ per°F (68-392 F)	18.4 10 ⁻⁶ per°C (20-200 C)
Magnetic Permeability (F.S.=16kA/m)	1.00	1.00
Thermal Conductivity	40.8 Btu•ft/(hr•ft ² •°F) at 68 F	70.6 W/m•°K at 20 C
Electrical Conductivity	10 %IACS at 68 F	0.056 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	15,000 ksi	103,400 MPa

Mechanical Properties*

<i>M01 - AS SAND CAST</i>		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	35 ksi	241 MPa	ASTM B 427
	Minimum	35 ksi	240 MPa	SAE J462-A
	Typical	44 ksi	303 MPa	
Yield Strength 0.5% Ext. under load	Minimum	17 ksi	117 MPa	ASTM B 427
	Minimum	18 ksi	125 MPa	SAE J462-A
	Typical	22 ksi	152 MPa	
Elongation	Minimum	10 %, in 2 in.	10 %, in 51 mm	ASTM B 427; SAE J462-A
	Typical	20 %, in 2 in.	20 %, in 51 mm	
Brinell Hardness 500 kg load	Minimum	65	65	ASTM B 427
	Typical	80	80	
Fatigue Strength at 10 ⁶ cycles	Typical	25 ksi	172 MPa	

<i>M02 - AS CENTRIFUGAL CAST</i>		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	50 ksi	345 MPa	ASTM B 427
	Typical	55 ksi	379 MPa	
Yield Strength 0.5% Ext. under load	Minimum	28 ksi	193 MPa	ASTM B 427
	Typical	30 ksi	207 MPa	
Elongation	Minimum	12 %, in 2 in.	12 %, in 51 mm	ASTM B 427
	Typical	16 %, in 2 in.	16 %, in 51 mm	
Brinell Hardness 500 kg load	Minimum	95	95	ASTM B 427
	Typical	102	102	

Mechanical Properties*

M05 - AS PERMANENT MOLD CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Typical	55 ksi	379 MPa	
Yield Strength				
0.5% Ext. under load	Typical	30 ksi	207 MPa	
Elongation	Typical	16 %, in 2 in.	16 %, in 51 mm	
Brinell Hardness				
500 kg load	Typical	102	102	

M07 - AS CONTINUOUS CAST		US Customary	Metric	Applicable Specifications
Tensile Strength	Minimum	40 ksi	276 MPa	ASTM B 505
	Minimum	40 ksi	275 MPa	SAE J462-B
Yield Strength				
0.5% Ext. under load	Minimum	25 ksi	172 MPa	ASTM B 505
	Minimum	25 ksi	170 MPa	SAE J462-B
Elongation	Minimum	10 %, in 2 in.	10 %, 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 mechanicals properties, heat treatments, conditions, etc., as applicable. See Society of Automotive Engineers Inc., SAE Handbook, Vol. 1 Materials, 1989, Warrendale, PA 15096.