

COPPER ALLOY No. C31600 (LEADED COMMERCIAL BRONZE, NICKEL BEARING)

Composition — percent

	Nominal	Minimum	Maximum
Copper	89	87.5	90.5
Lead	1.9	1.3	2.5
Iron	.....	.....	.10
Zinc	8.1	Remainder	
Nickel	1	.7	1.2
Phosphorus	.....	.....	.10

Nearest Applicable A S T M Specifications

Flat Products	B140
Pipe	
Rod	B140
Shapes	B140
Tube	
Wire	

Physical Properties

	English Units	C. G. S. Units
Melting Point (Liquidus)	1900 F	1040 C
Melting Point (Solidus)	1850 F	1010 C
Density	.320 lb/cu in @ 68 F	8.86 gm/cu cm @ 20 C.
Specific Gravity	8.86	8.86
Coefficient of Thermal Expansion	per °F from 68 F to 212 F	per °C from 20 C to 100 C
Coefficient of Thermal Expansion	per °F from 68 F to 392 F	per °C from 20 C to 200 C
Coefficient of Thermal Expansion	.0000102 per °F from 68 F to 572 F	.0000184 per °C from 20 C to 300 C
Thermal Conductivity	81 Btu/sq ft/ft/hr/°F @ 68 F	.33 cal/sq cm/cm/sec/°C @ 20 C
Electrical Resistivity (Annealed)	32.4 Ohms (circ mil/ft) @ 68 F	5.39 Microhm-cm @ 20 C
Electrical Conductivity* (Annealed)	32 % IACS @ 68 F	.186 Megmho-cm @ 20 C
Thermal Capacity (Specific Heat)	.09 Btu/lb °F @ 68 F	.09 cal/gm/°C @ 20 C
Modulus of Elasticity (Tension)	17,000 ksi	12,000 Kg/sq mm
Modulus of Rigidity	ksi	Kg/sq mm

*Volume Basis

Typical Uses

Electrical connectors, fasteners, hardware, nuts, screws, screw machine parts

Common Fabrication Processes

Machining

Fabrication Properties

Capacity for Being Cold Worked	Good
Capacity for Being Hot Formed	Poor
Hot Forgeability Rating (Forging Brass = 100)	Good
Hot Working Temperature	F or C
Annealing Temperature	800-1200 F or 425-650 C
Machinability Rating (Free Cutting Brass = 100)	80

Suitability for being joined by:	
Soldering	Excellent
Brazing	Good
Oxyacetylene Welding	Not Recommended
Gas Shielded Arc Welding	Not Recommended
Coated Metal Arc Welding	Not Recommended
Resistance Welding	
Spot	Not Recommended
Seam	Not Recommended
Butt	Fair

Forms and Tempers Most Commonly Used

Forms and Tempers Most Commonly Used	Annealed Tempers				Rolled or Drawn Tempers							Hot Finished Tempers													
	Nominal Grain Size mm																								
	.100 (OS10C)	.070 (OS070)	.050 (OS050)	.035 (OS035)	.025 (OS025)	.015 (OS015)	Soft Anneal (O50)	Light Anneal (O50)	Eighth Hard (H00)	Quarter Hard (H01)	Half Hard (H02)	Three Quarter Hard (H03)	Hard (H04)	Extra Hard (H05)	Spring (H08)	Extra Spring (H10)	Drawn — General Purpose (H58)	Hard Drawn (H80)	Light Drawn — Bending (H55)	As Hot Rolled (M20)	As Extruded (M30)	Special Tempers			
FLAT PRODUCTS	Strip, Rolled																								
	Strip, Drawn																								
	Flat Wire, Rolled																								
	Flat Wire, Drawn																								
	Bar, Rolled																								
	Bar, Drawn																								
	Sheet																								
	Plate																								
	ROD																								
	WIRE																								
TUBE																									
PIPE																									
SHAPES																									

DRAWN-GENERAL PURPOSE (H58) temper is used for general purpose tube only, usually where there is no real requirement for high strength or hardness on the one hand or for bending qualities on the other.

HARD DRAWN (H80) temper is used only where there is need for a tube as hard or as strong as is commercially feasible for the size in question.

LIGHT DRAWN-BENDING (H55) temper is used only where a tube of some stiffness, but yet capable of readily being bent (or otherwise moderately cold worked) is needed.

Mechanical Properties

Form	Size Section in.	Temper	Tensile Strength ksi	Yield Strength		Elongation in 2 in. %	Rockwell Hardness			Shear Strength ksi	Fatigue Strength	
				(.5% Ext. under Load) ksi	(.2% Offset) ksi		F	B	30T		ksi	Million Cycles
BAR	.250 in.	Hard	63.0	56.0	.....	12	-	70	-	.....	.....	.....
ROD	1.0 in.	.050 mm	37.0	12.0	.....	45	55	-	-	24.0	.....	.....
	.500 in.	Hard (38%)	67.0	59.0	.....	13	-	72	-	40.0	.....	.....
	1.0 in.	Hard (38%)	65.0	57.0	.....	15	-	70	-	39.0	.....	.....

The values listed above represent reasonable approximations suitable for general engineering use. Due to commercial variations in composition and to manufacturing limitations, they should not be used for specification purposes. See applicable A.S.T.M. specification references.