COPPER ALLOY No. C22000 *(COMMERICAL BRONZE, 90%)*

Composition – percent

	Nominal	Minimum	Maximum
Copper	90	89.0	91.0
Lead	....	....	.05
Iron	....	....	.05
Zinc	10	Remainder	

Nearest Applicable A S T M Specifications

Flat Products	B36, B130, B131, B134
Pipe	
Rod	
Shapes	B130, B131
Tube	B135, B372, B587
Wire	B134

Physical Properties

	English Units	C. G. S. Units
Melting Point (Liquidus)	1910 F	1045 C
Melting Point (Solidus)	1870 F	1020 C
Density	.318 lb /cu in @ 68 F	8.80 gm /cu cm @ 20 C.
Specific Gravity	8.80	8.80
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	109 Btu /sq ft /ft /hr /°F @ 68 F	.45 cal /sq cm /cm /sec /° C @ 20 C
Electrical Resistivity (Annealed)	23.6 Ohms (circ mil /ft) @ 68 F	3.92 Microhm-cm @ 20 C
Electrical Conductivity* (Annealed)	44 % IACS @ 68 F	.255 Megmho-cm @ 20 C
Thermal Capacity (Specific Heat)	.09 Btu /lb °F @ 68 F	.09 cal /gm /° C @ 20 C
Modulus of Elasticity (Tension)	17,000,000 ksi	12,000 Kg /sq mm
Modulus of Rigidity	6,400,000 ksi	4,500 Kg /sq mm

* Volume Basis

Typical Uses

ARCHITECTURAL: etching bronze, grillwork, screen cloth, weatherstripping
COSMETICS: compacts, lipstick cases
HARDWARE: escutcheons, kick plates, line clamps, marine hardware, rivets, screws, screw shells
MUNITIONS: primer caps, rotating bands
MISCELLANEOUS: costume jewelry, ornamental trim, screen wire, vitreous enamel base

Common Fabrication Processes

Blanking, coining, drawing, etching, forming and bending, heading and upsetting, hot forging and pressing, piercing and punching, roll threading and knurling, shearing, spinning, squeezing and swaging, stamping

Fabrication Properties

Capacity for Being Cold Worked ..... Excellent
Capacity for Being Hot Formed ..... Good
Hot Forgeability Rating (Forging Brass = 100) .....
Hot Working Temperature .... 1400-1600 F or 750-875 C
Annealing Temperature ..... 800-1450 F or 425-800 C
Machinability Rating (Free Cutting Brass = 100) 20

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

Forms and Tempers Most Commonly Used

		Annealed Tempers (Nominal Grain Size mm)							Rolled or Drawn Tempers											Hot Finished Tempers		
		.100 (OS100)	.070 (OS070)	.050 (OS050)	.035 (OS035)	.025 (OS025)	.015 (OS015)	Soft Anneal (O60)	Light Anneal (O50)	Eighth Hard (H00)	Quarter Hard (H01)	Half Hard (H02)	Three Quarter Hard (H03)	Hard (H04)	Extra Hard (H06)	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 (.5% Ext. under Load) ksi	Yield Strength (.2% Offset) ksi	Elongation in 2 in. %	Rockwell Hardness F	Rockwell Hardness B	Rockwell Hardness 30T	Shear Strength ksi	Fatigue Strength ksi	Fatigue Strength Million Cycles
FLAT PRODUCTS	.040 in.	.050 mm	37.0	10.0	....	45	53	–	6	28.0	....	....
		.035 mm	38.0	12.0	....	45	57	–	12	30.0	....	....
		.025 mm	39.0	14.0	....	44	60	–	16	31.0	....	....
		.015 mm	41.0	15.0	....	42	65	–	26	32.0	....	....
		Quarter Hard	45.0	35.0	....	25	–	42	44	33.0	....	....
		Half Hard	52.0	45.0	....	11	–	58	56	35.0	....	....
		Hard	61.0	54.0	....	5	–	70	63	38.0	....	....
		Extra Hard	67.0	58.0	....	4	–	75	67	40.0	....	....
		Spring	72.0	62.0	....	3	–	78	69	42.0	21.0	15
	.250 in.	.035 mm	38.0	12.0	....	50	57	–	–	30.0	....	....
		Half Hard	52.0	45.0	....	15	–	58	–	35.0	....	....
	.040 in.	As Hot Rolled	39.0	14.0	....	44	60	–	–	31.0	....	....
	.250 in.	As Hot Rolled	37.0	10.0	....	45	53	–	–	28.0	....	....
WIRE	.080 in.	.035 mm	40.0	....	....	50	–	–	–	30.0	....	....
		.015 mm	42.0	....	....	48	–	–	–	32.0	....	....
		Eighth Hard	44.0	....	....	27	–	–	–	33.0	....	....
		Quarter Hard	50.0	....	....	13	–	–	–	34.0	....	....
		Half Hard	60.0	....	....	6	–	–	–	37.0	....	....
		Hard	74.0	....	....	4	–	–	–	42.0	23.0	100
		Extra Hard	83.0	....	....	3	–	–	–	....	....	....
		Spring	90.0	....	....	3	–	–	–	....	....	....
TUBE	1.0 in. OD X .065 in.	.035 mm	38.0	12.0	....	50	57	–	12	....	....	....
		Hard Drawn (35%)	60.0	53.0	....	6	–	69	62	....	....	....
ROD	.500 in.	.035 mm	40.0	....	....	50	55	–	–	32.0	....	....
		Eighth Hard	45.0	....	....	25	–	42	–	33.0	....	....

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.