

COPPER ALLOY Nos. C46400, C46500, C46600 and C46700 (NAVAL BRASS, UNINHIBITED)

Composition — percent

	Nominal	Minimum	Maximum
Copper	60	59.0	62.0
Lead	.....	.....	.20
Iron	.....	.....	.10
Tin	8	.50	1.0
Zinc	39.2	Remainder	
As*	.....	.02	.06
Sb or P**	.....	.02	.10

*The uninhibited alloy is Copper Alloy No. C46400.

**Arsenic, Antimony and Phosphorus inhibited alloys are identified respectively as Copper Alloy Nos. C46500, C46600 and C46700.

Nearest Applicable A S T M Specifications

Flat Products	B21, B124, B171, B432
Pipe	
Rod	B21, B124
Shapes	B21, B124, B283
Tube	
Wire	

Physical Properties

	English Units	C. G. S. Units
Melting Point (Liquidus)	1650 F	900 C.
Melting Point (Solidus)	1630 F	885 C
Density	.304 lb/cu in @ 68 F	8.41 gm/cu cm @ 20 C.
Specific Gravity	8.41	8.41
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	.0000118 per °F from 68 F to 572 F	.0000212 per °C from 20 C to 300 C
Thermal Conductivity	67 Btu/sq ft /hr /°F @ 68 F	.28 cal /sq cm /cm /sec /°C @ 20 C
Electrical Resistivity (Annealed)	39.9 Ohms (circ mil /ft) @ 68 F	6.63 Microhm-cm @ 20 C
Electrical Conductivity* (Annealed)	26 % IACS @ 68 F	.151 Megmho-cm @ 20 C
Thermal Capacity (Specific Heat)	.09 Btu /lb °F @ 68 F	.09 cal /gm /°C @ 20 C
Modulus of Elasticity (Tension)	15,000 ksi	10,500 Kg /sq mm
Modulus of Rigidity	5,600 ksi	3,900 Kg /sq mm

Typical Uses

- HARDWARE:** aircraft turnbuckle barrels, balls, bolts, marine hardware, nuts, propeller shafts, rivets, structural uses, valve stems
- INDUSTRIAL:** condenser plates, welding rod

Common Fabrication Processes

Blanking, drawing, forming and bending, heading and upsetting, hot forging and pressing, hot heading and upsetting, shearing

Fabrication Properties

Suitability for Being Cold Worked	Fair
Suitability for Being Hot Formed	Excellent
Forgeability Rating (Forging Brass = 100)	90
Working Temperature	1200-1500 F or 650-825 C
Forging Temperature	800-1100 F or 425-600 C
Forgeability Rating (Free Cutting Brass = 100)	30

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

Forms and Tempers Most Commonly Used

	Annealed Tempers						Rolled or Drawn Tempers						Hot Finished Tempers											
	Nominal Grain Size mm																							
	.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 (H68)	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
FLAT PRODUCTS	.040 in.	Light Anneal	62.0	30.0	.....	40	60	57	41.0	.....	.....
		Quarter Hard	70.0	58.0	.....	17	75	68	43.0	.....	.....
	.250 in.	Soft Anneal	58.0	25.0	.....	49	56	53	40.0	.....	.....
		Light Anneal	60.0	28.0	.....	45	58	56	41.0	.....	.....
ROD	.10 in.	As Hot Rolled	55.0	25.0	.....	50	55	55	40.0	.....	.....
		Soft Anneal	58.0	27.0	.....	45	56	55	40.0	.....	.....
	.250 in.	Light Anneal	63.0	30.0	.....	40	60	60	42.0	.....	.....
		Quarter Hard (10%)	70.0	48.0	.....	25	80	80	43.0	.....	.....
	.10 in.	Half Hard (20%)	80.0	57.0	.....	20	85	85	45.0	.....	.....
		Soft Anneal	57.0	25.0	.....	47	55	55	40.0	.....	.....
	.250 in.	Light Anneal	63.0	30.0	.....	40	60	60	42.0	.....	.....
		Quarter Hard (8%)	69.0	46.0	.....	27	78	78	43.0	.....	.....
	.10 in.	Half Hard (20%)	75.0	53.0	.....	20	82	82	44.0	.....	.....
		Soft Anneal	56.0	25.0	.....	47	55	55	40.0	.....	.....
.250 in.	Light Anneal	62.0	28.0	.....	43	60	60	42.0	.....	.....
	Quarter Hard (8%)	67.0	40.0	.....	35	75	75	43.0	.....	.....
TUBE	.375 in. OD X .097 in.	Hard Drawn (35%)	88.0	66.0	.....	18	95	95	.....	.....	.....

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.