

COPPER ALLOY Nos. C44300 (ADMIRALTY, ARSENICAL), C44400 (ADMIRALTY, ANTIMONIAL) and C44500 (ADMIRALTY, PHOSPHORIZED)

Composition — percent

| | Nominal | Minimum | Maximum |
|-----------|---------|-----------|---------|
| Copper | 71 | 70.0 | 73.0 |
| Lead | ..... | ..... | .07 |
| Iron | ..... | ..... | .06 |
| Tin | 1 | .8 | 1.2 |
| Zinc | .28 | Remainder | ..... |
| AS** | ..... | .02 | .06 |
| Sb or P** | ..... | .02 | .10 |

*For tubular products, the minimum tin may be .9%.

**Arsenic, Antimony and Phosphorus inhibited alloys are identified respectively by Copper Alloy Nos. C44300, C44400 and C44500.

Nearest Applicable A S T M Specifications

| | |
|---------------|------------------|
| Flat Products | B171, B432 |
| Pipe | |
| Rod | |
| Shapes | |
| Tube | B111, B359, B395 |
| Wire | |

Physical Properties

| | English Units | C. G. S. Units |
|-------------------------------------|------------------------------------|------------------------------------|
| Melting Point (Liquidus) | 1720 F | 935 C |
| Melting Point (Solidus) | 1650 F | 900 C |
| Density | .308 lb /cu in @ 68 F | 8.53 gm /cu cm @ 20 C. |
| Specific Gravity | 8.53 | 8.53 |
| 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 | .0000112 per °F from 68 F to 572 F | .0000202 per °C from 20 C to 300 C |
| Thermal Conductivity | 64 Btu /sq ft /ft /hr °F @ 68 F | .26 cal /sq cm /cm /sec /°C @ 20 C |
| Electrical Resistivity (Annealed) | 41.5 Ohms (circ mil /ft) @ 68 F | 6.90 Microhm-cm @ 20 C |
| Electrical Conductivity* (Annealed) | 25 % IACS @ 68 F | .145 Meghm-cm @ 20 C |
| Thermal Capacity (Specific Heat) | .09 Btu /lb °F @ 68 F | .09 cal /gm /°C @ 20 C |
| Modulus of Elasticity (Tension) | 16,000 ksi | 11,200 Kg /sq mm |
| Modulus of Rigidity | 6,000 ksi | 4,200 Kg /sq mm |

* Volume Basis

Typical Uses

INDUSTRIAL: condenser, evaporator and heat exchanger tubes, condenser tube plates, distiller tubes, ferrules

Common Fabrication Processes

Forming and bending, machining

Fabrication Properties

Capacity for Being Cold Worked Excellent
 Capacity for Being Hot Formed Fair
 Hot Forgeability Rating (Forging Brass = 100)
 Hot Working Temperature 1200-1450 F or 650-800 C
 Annealing Temperature 800-1100 F or 425-600 C
 Machinability 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 Not Recommended
 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 (O50) | 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 | | | | | | | | | | | | | | | | | | | | | | | |
| | 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) | (.2% Offset) | | | | ksi | Million Cycles |
| TUBE | 1.0 in. OD X .065 in. | .025 mm | 53.0 | 22.0 | ..... | 65 | 75 — 37 | ..... | ..... | ..... |
| PLATE | 1.0 in. | As Hot Rolled | 48.0 | 18.0 | ..... | 65 | 70 — — | ..... | ..... | ..... |
| WIRE | .080 in. | .015 mm | 55.0 | ..... | ..... | 60 | — — — | ..... | ..... | ..... |

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.