

**Specifications Equivalents**

| Alloy No.                            | DIN Material No. |
|--------------------------------------|------------------|
| C17510<br>Class III Beryllium Copper | 2.0850           |

**Chemical Composition % by Weight**

| Be        | Ni        | Cu      |
|-----------|-----------|---------|
| 0.2 - 0.6 | 1.4 - 2.2 | Balance |

**Material Properties**

High thermal conductivity combined with good hardness and high temperature strength. Good resistance to tempering. Not suitable for case hardening or nitriding.

**Applications**

Low pressure blow molds. Limited applications for injection molds. Inserts in steel and aluminum molds. Provides higher cooling rates at critical mold areas. Sealing tools. Cooling inserts in molds and casting molds. Plungers for die casting of light metal castings. Nozzles and needles for hot runner systems.

**Mechanical Properties**

| Hardness           | Brinell | *163-213 | RB92-102 |
|--------------------|---------|----------|----------|
| Tensile Strength** | KSI     | 115      |          |
| Yield Strength**   | KSI     | 100      |          |
| Elongation**       | %       | 10       |          |
| Elastic Modules    | KSI     | 19,200   |          |

\*Hardness Conversions are approximate.

\*\*Tensile Test values are nominal approximations and depend on specimen size and orientation.



**Physical Properties**

|                      |                                      |                         |
|----------------------|--------------------------------------|-------------------------|
| Thermal Conductivity | BTU/(ft hr F)                        | 145                     |
| Specific Heat        | BTU/lb/F                             | 0.1                     |
| Thermal Expansion    | in/in/F                              | 10.0 x 10 <sup>-6</sup> |
| Density              | lb/cu/F                              | 0.317                   |
| Hot Forming***       | 1500-1750°F                          | Air or Water Cooled     |
| Heat Treatment***    | Anneal 1650-1750°F to approx. HB 100 | 1/2 hr. & Water Quench  |
|                      | Harden 900°F to approx. HB 200       | 3 hr. Air Cool          |

\*\*\*Class III Beryllium Copper is pre-tempered to the correct strength. Hot forming and further heat treatment are not needed or recommended. Direct machining to desired configuration is preferred.

**Machining Data**

| Machining           | Tungsten Carbide | High Speed Steel |
|---------------------|------------------|------------------|
| <b>Turning</b>      |                  |                  |
| cutting speed (SFM) | 1500 - 1800      | 200 - 300        |
| rake angle (Deg)    | 5                | 10               |
| feed (IPR)          | .010             | .025             |
| <b>Milling</b>      |                  |                  |
| cutting speed (SFM) | 800 - 1600       | 400 - 800        |
| rake angle (Deg)    | 10               | 10               |
| feed (inch/tooth)   | .005 - .008      | .005 - .008      |
| depth of cut        | .050 - .125      | .050 - .125      |
| <b>Drilling</b>     |                  |                  |
| cutting speed (SFM) |                  | 200 - 600        |
| feed (IPR)          |                  | .002 - .009      |



**Composition—percent**

|  | Nominal | Minimum | Maximum |
|--|---------|---------|---------|
| Copper   | 96.9    | ....    | ....    |
| Iron   | ....    | ....    | .10     |
| Nickel   | 1.7     | 1.4     | 2.2     |
| Beryllium  | .4      | .2      | .6      |
| Copper (incl. Ag)<br>+Elements with<br>Specific Limits | ....    | 99.5    | ....    |

**Nearest Applicable A S T M Specifications**

|               |            |
|---------------|------------|
| Flat Products | B441, B534 |
| Pipe          |            |
| Rod           | B441       |
| Shapes        |            |
| Tube          |            |
| Wire          |            |

**Physical Properties**

|                                       | English Units                       | C.G.S. Units                          |
|---------------------------------------|-------------------------------------|---------------------------------------|
| Melting Point (Liquidus)              | 1955 F                              | 1068 C                                |
| Melting Point (Solidus)               | 1885 F                              | 1029 C                                |
| Density                               | .316 lb/cu in @ 68 F                | 8.75 gm/cu cm @ 20 C                  |
| Specific Gravity                      | 8.75                                | 8.75                                  |
| Coefficient of Thermal Expansion      | per ° F from 68 F to 212 F          | per ° C from 20 C to 100 C            |
| Coefficient of Thermal Expansion      | .0000098 per ° F from 68 F to 392 F | .0000176 per ° C from 20 C to 200 C   |
| Coefficient of Thermal Expansion      | per ° F from 68 F to 572 F          | per ° C from 20 C to 300 C            |
| Thermal Conductivity                  | 120 - 150 Btu/sq ft/ft/hr/°F @ 68 F | .49 - .62 cal/sq cm/cm/sec/° C @ 20 C |
| Electrical Resistivity (Annealed)     | 22.8 Ohms (circ mil/ft) @ 68 F      | 3.79 Microhm-cm @ 20 C                |
| Electrical Conductivity* (Annealed)** | 45 % IACS @ 68 F                    | .261 Megmho-cm @ 20 C                 |
| Thermal Capacity (Specific Heat)      | .10 Btu/lb °F @ 68 F                | .10 cal/gm/° C @ 20 C                 |
| Modulus of Elasticity (Tension)       | 19,000,000 psi                      | 13,500 Kg/sq mm                       |
| Modulus of Rigidity                   | 7,500,000 psi                       | 5,250 Kg/sq mm                        |

\*In the precipitation hardened condition  
\*\*Volume Basis

**Typical Uses**

**HARDWARE:** fuse clips, fasteners, springs, switch parts, relay parts, electrical conductors  
**INDUSTRIAL:** welding equipment

**Common Fabrication Processes**

Blanking, forming and bending, turning, drilling, tapping

**Fabrication Properties**

Capacity for Being Cold Worked ..... Excellent  
Capacity for Being Hot Formed ..... Good  
Hot Forgeability Rating (Forging Brass = 100) .....  
Hot Working Temperature ..... 1200-1625 F or 650-765 C  
Machinability Rating (Free Cutting Brass = 100) .....  
Solution Heat Treating Temperature ..... 1675-1725 F or 900-950 C

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

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.



Forms and Tempers  
Most Commonly Used

| Forms and Tempers<br>Most Commonly Used | Annealed Tempers      |      |      |      |      |      |             | Rolled or Drawn Tempers |                                       |   |   |                                |               | Hot Finished Tempers          |               |             |                 |
|---|-----------------------|------|------|------|------|------|-------------|-------------------------|---------------------------------------|---|---|--------------------------------|---------------|-------------------------------|---------------|-------------|-----------------|
|   | Nominal Grain Size mm |      |      |      |      |      |             | Solution Heat Treated   | Solution Heat Treated and Cold Worked | Solution Heat Treated, Cold Worked and Aged | Solution Heat Treated, Cold Worked, Aged, and Cold Worked | Solution Heat Treated and Aged | Mill Annealed | Mill Annealed and Cold Worked | As Hot Rolled | As Extruded | Special Tempers |
|   | .100                  | .070 | .050 | .035 | .025 | .015 | Soft Anneal |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Strip, Rolled                           |                       |      |      |      |      |      | •           | •                       | •                                     |   |   |                                |               |                               |               |             |                 |
| Strip, Drawn                            |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Flat Wire, Rolled                       |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Flat Wire, Drawn                        |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Bar, Rolled                             |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Bar, Drawn                              |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Sheet                                   |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| Plate                                   |                       |      |      |      |      |      | •           | •                       | •                                     | •   |   |                                | •             |                               |               |             |                 |
| ROD                                     |                       |      |      |      |      |      | •           | •                       | •                                     | •   | •   |                                | •             | •                             | •             | •           | •               |
| WIRE                                    |                       |      |      |      |      |      | •           | •                       | •                                     | •   | •   | •                              | •             | •                             | •             | •           | •               |
| TUBE                                    |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| PIPE                                    |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |
| SHAPES                                  |                       |      |      |      |      |      |             |                         |                                       |   |   |                                |               |                               |               |             |                 |

Mechanical Properties

| Form          | Size Section<br>in.            | Temper   | Tensile Strength<br>ksi | Yield Strength       |              | Elongation<br>in 2 in.<br>% | Rockwell Hardness |    |     | Shear Strength<br>ksi | Fatigue Strength |                |
|---------------|--------------------------------|--|-------------------------|----------------------|--------------|-----------------------------|-------------------|----|-----|-----------------------|------------------|----------------|
|               |                                |  |                         | (.5 Ext. under Load) | (.2% Offset) |                             | F                 | B  | 30T |                       | ksi              | Million Cycles |
|               |                                |  |                         | ksi                  | ksi          |                             |                   |    |     |                       |                  |                |
| FLAT PRODUCTS | .040 in.                       | Solution Heat Treated  | 34.0                    | 19.0                 | ....         | 40                          | —                 | 16 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated and Aged (500C-3 hrs)                          | 51.0                    | 36.0                 | ...          | 22                          | —                 | 59 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated and Cold Worked (50%)                          | 53.0                    | 51.0                 | ....         | 6                           | —                 | 66 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated, Cold Worked (50%), and Aged (450C-3 hrs)      | 67.0                    | 59.0                 | ....         | 14                          | —                 | 79 | —   | ...                   | ....             | ....           |
| PLATE         | 2.0 in.                        | Solution Heat Treated and Aged                                       | 58.0                    | 42.0                 | ....         | 25                          | —                 | 70 | —   | ...                   | ....             | ....           |
|               | 3.0 in.                        | Solution Heat Treated and Aged                                       | 56.0                    | 40.0                 | ....         | 30                          | —                 | 68 | —   | ...                   | ....             | ....           |
| ROD           | .156 in.                       | Solution Heat Treated and Cold Worked (91%)                          | 74.0                    | 73.0                 | ....         | 5                           | —                 | —  | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated, Cold Worked (90%), and Aged                   | 86.0                    | 77.0                 | ....         | 14                          | —                 | —  | —   | ...                   | ....             | ....           |
|               | .500 in.                       | Solution Heat Treated  | 45.0                    | 14.0                 | ....         | 40                          | —                 | —  | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated and Aged (500C-3 hrs)                          | 70.0                    | 55.0                 | ....         | 21                          | —                 | 70 | —   | ...                   | ....             | ....           |
|               | 1.0 in.                        | Solution Heat Treated and Cold Worked (60.5%)                        | 57.0                    | 56.0                 | ....         | 11                          | —                 | 65 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated and Cold Worked (60.5%) and Aged (450C-3 hrs)  | 77.0                    | 65.0                 | ....         | 16                          | —                 | 82 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated, Cold Worked (50%), Aged and Cold Worked (6%)  | 77.0                    | 67.0                 | ....         | 19                          | —                 | 83 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated and Aged                                       | 72.0                    | 65.0                 | ....         | 18                          | —                 | 80 | —   | ...                   | ....             | ....           |
| 2.0 in.       | Solution Heat Treated and Aged | 70.0   | 65.0                    | ....                 | 18           | —                           | 75                | —  | ... | ....                  | ....             |                |
| 3.0 in.       | Solution Heat Treated and Aged | 65.0   | 55.0                    | ....                 | 18           | —                           | 70                | —  | ... | ....                  | ....             |                |
| 4.0 in.       | Solution Heat Treated and Aged | 55.0   | 43.0                    | ....                 | 25           | —                           | 68                | —  | ... | ....                  | ....             |                |
| TUBE          | 3/8 in.OD X .094 in.           | Mill Annealed  | 40.0                    | 15.0                 | ....         | 50                          | 59                | —  | —   | ...                   | ....             | ....           |
|               | 1.250in.OD X .212 in.          | Solution Heat Treated and Cold Worked (76%)                          | 59.0                    | 57.0                 | ....         | 21                          | —                 | 67 | —   | ...                   | ....             | ....           |
|               |                                | Solution Heat Treated, Cold Worked (76%), Aged and Cold Worked (28%) | 69.0                    | 63.0                 | ....         | 26                          | —                 | 84 | —   | ...                   | ....             | ....           |

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