

Overview of materials for Copper Alloy

Physical Properties	Metric	English	Comments
Density	5.40 - 23.1 g/cc	0.195 - 0.836 lb/in ³	Average value: 8.67 g/cc Grade Count:4383
Porosity	0.400 - 95.0 %	0.400 - 95.0 %	Average value: 18.8 % Grade Count:10
Particle Size	0.0220 - 105 μm	0.0220 - 105 μm	Average value: 15.2 μm Grade Count:32
Molecular Weight	63.5 g/mol	63.5 g/mol	Average value: 63.5 g/mol Grade Count:4
Thickness	2.00 - 140 microns	0.0787 - 5.51 mil	Average value: 56.8 microns Grade Count:12
Chemical Properties	Metric	English	Comments
Thermal Neutron Cross Section	3.80 barns/atom	3.80 barns/atom	Average value: 3.80 barns/atom Grade Count:3
Electrode Potential	-0.520 - -0.340 V	-0.520 - -0.340 V	Average value: -0.430 V Grade Count:3
Mechanical Properties	Metric	English	Comments
Hardness, Brinell	11.6 - 420	11.6 - 420	Average value: 129 Grade Count:360
Hardness, Rockwell B	6.00 - 150	6.00 - 150	Average value: 69.3 Grade Count:1561
Hardness, Rockwell C	18.0 - 100	18.0 - 100	Average value: 33.2 Grade Count:276
Hardness, Rockwell F	8.00 - 110	8.00 - 110	Average value: 70.3 Grade Count:665
Hardness, Rockwell 30T	4.00 - 240	4.00 - 240	Average value: 57.4 Grade Count:821
Hardness, Rockwell HR30N	37.0 - 80.0	37.0 - 80.0	Average value: 54.1 Grade Count:30
Hardness, Rockwell H	45.0 - 90.0	45.0 - 90.0	Average value: 70.7 Grade Count:20
Hardness, Vickers	18.0 - 475	18.0 - 475	Average value: 211 Grade Count:535
Tensile Strength, Ultimate	0.250 - 2170 MPa	36.3 - 315000 psi	Average value: 507 MPa Grade Count:4359
Tensile Strength, Yield	0.250 - 1590 MPa	36.3 - 231000 psi	Average value: 390 MPa Grade Count:3870
Elongation at Break	0.000 - 80.0 %	0.000 - 80.0 %	Average value: 21.2 % Grade Count:4157
Elongation at Yield	5.00 - 15.0 %	5.00 - 15.0 %	Average value: 9.60 % Grade Count:5
Reduction of Area	0.000 - 80.0 %	0.000 - 80.0 %	Average value: 42.3 % Grade Count:125
Creep Strength	0.0758 - 228 MPa	11.0 - 33000 psi	Average value: 85.4 MPa Grade Count:10
Modulus of Elasticity	0.0960 - 250 GPa	13.9 - 36300 ksi	Average value: 117 GPa Grade Count:3985
Flexural Yield Strength	216 - 908 MPa	31300 - 132000 psi	Average value: 550 MPa Grade Count:36
Flexural Modulus	0.162 - 0.190 GPa	23.5 - 27.6 ksi	Average value: 0.177 GPa Grade Count:12
Compressive Yield Strength	48.3 - 2580 MPa	7000 - 375000 psi	Average value: 543 MPa Grade Count:179
Bearing Yield Strength	207 - 262 MPa	30000 - 38000 psi	Average value: 241 MPa Grade Count:3
Bulk Modulus	140 GPa	20300 ksi	Average value: 140 GPa Grade Count:3
Poissons Ratio	0.181 - 0.460	0.181 - 0.460	Average value: 0.323 Grade Count:2369
Fatigue Strength	0.276 - 552 MPa	40.0 - 80100 psi	Average value: 187 MPa Grade Count:591
Machinability	2.00 - 400 %	2.00 - 400 %	Average value: 36.2 % Grade Count:2830
Shear Modulus	25.5 - 115 GPa	3700 - 16700 ksi	Average value: 44.2 GPa Grade Count:2458
Shear Strength	44.0 - 538 MPa	6380 - 78000 psi	Average value: 235 MPa Grade Count:1042
Izod Impact	2.70 - 115 J	1.99 - 85.0 ft-lb	Average value: 32.7 J Grade Count:109
Izod Impact, Unnotched	0.620 - 1.30 J/cm	1.16 - 2.44 ft-lb/in	Average value: 0.963 J/cm Grade Count:3
Charpy Impact	2.70 - 135 J	1.99 - 99.6 ft-lb	Average value: 44.7 J Grade Count:207
Charpy Impact, Unnotched	4.07 - 75.9 J	3.00 - 56.0 ft-lb	Average value: 23.8 J Grade Count:7
Coefficient of Friction	0.100 - 0.530	0.100 - 0.530	Average value: 0.388 Grade Count:20
Coefficient of Friction, Static	0.530 - 1.05	0.530 - 1.05	Average value: 0.753 Grade Count:19
Peel Strength	0.329 - 0.438 kN/m	1.88 - 2.50 pli	Average value: 0.383 kN/m Grade Count:6
Bend Radius, Minimum	0.000 - 8.00 t	0.000 - 8.00 t	Average value: 1.64 t Grade Count:18
Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.00000167 - 0.0108 ohm-cm	0.00000167 - 0.0108 ohm-cm	Average value: 0.0000153 ohm-cm Grade Count:4109
Surface Resistance	0.0300 - 0.300 ohm	0.0300 - 0.300 ohm	Average value: 0.127 ohm Grade Count:3
Magnetic Permeability	0.800 - 80.0	0.800 - 80.0	Average value: 2.52 Grade Count:241

Magnetic permeability	0.000 - 00.0	0.000 - 00.0	Average value: 0.000 Grade Count:541
Magnetic Susceptibility	-0.0000125 - -8.00e-8	-0.0000125 - -8.00e-8	Average value: -0.00000143 Grade Count:75
Shielding Effectiveness	65.0 - 110 dB	65.0 - 110 dB	Average value: 87.1 dB Grade Count:4

Thermal Properties	Metric	English	Comments
CTE, linear	7.00 - 160 µm/m-°C	3.89 - 88.9 µin/in-°F	Average value: 17.7 µm/m-°C Grade Count:2377
Specific Heat Capacity	0.115 - 0.510 J/g-°C	0.0275 - 0.122 BTU/lb-°F	Average value: 0.384 J/g-°C Grade Count:2776
Thermal Conductivity	1.01 - 457 W/m-K	7.00 - 3170 BTU-in/hr-ft²-°F	Average value: 107 W/m-K Grade Count:3861
Melting Point	178 - 3410 °C	353 - 6170 °F	Average value: 997 °C Grade Count:3712
Solidus	178 - 1230 °C	353 - 2240 °F	Average value: 965 °C Grade Count:3018
Liquidus	547 - 3410 °C	1020 - 6170 °F	Average value: 1020 °C Grade Count:3385
Boiling Point	1400 - 2570 °C	2550 - 4650 °F	Average value: 1770 °C Grade Count:35
Maximum Service Temperature, Air	60.0 - 1000 °C	140 - 1830 °F	Average value: 316 °C Grade Count:49
Softening Point	355 - 800 °C	671 - 1470 °F	Average value: 399 °C Grade Count:27
Annealing Point	21.1 - 1040 °C	70.0 - 1900 °F	Average value: 567 °C Grade Count:1823
Minimum Service Temperature, Air	-34.0 - -18.0 °C	-29.2 - -0.400 °F	Average value: -23.1 °C Grade Count:7

Optical Properties	Metric	English	Comments
Reflection Coefficient, Visible (0-1)	0.630 - 0.700	0.630 - 0.700	Average value: 0.694 Grade Count:38

Processing Properties	Metric	English	Comments
Processing Temperature	149 - 1180 °C	300 - 2150 °F	Average value: 539 °C Grade Count:497
Annealing Temperature	225 - 950 °C	437 - 1740 °F	Average value: 593 °C Grade Count:1332
Solution Temperature	249 - 1100 °C	480 - 2010 °F	Average value: 852 °C Grade Count:356
Aging Temperature	260 - 510 °C	500 - 950 °F	Average value: 402 °C Grade Count:222
Hot-Working Temperature	316 - 1070 °C	600 - 1950 °F	Average value: 805 °C Grade Count:1833
Precipitation Temperature	304 - 510 °C	580 - 950 °F	Average value: 414 °C Grade Count:288
Casting Temperature	955 - 1430 °C	1750 - 2610 °F	Average value: 1120 °C Grade Count:44
Recrystallization Temperature	288 - 870 °C	550 - 1600 °F	Average value: 449 °C Grade Count:416

Component Elements Properties	Metric	English	Comments
Al2O3	0.150 - 1.10 %	0.150 - 1.10 %	Average value: 0.410 % Grade Count:42
Aluminum, Al	0.00500 - 51.5 %	0.00500 - 51.5 %	Average value: 3.35 % Grade Count:727
Antimony, Sb	0.000400 - 2.00 %	0.000400 - 2.00 %	Average value: 0.188 % Grade Count:355
Arsenic, As	0.000500 - 1.00 %	0.000500 - 1.00 %	Average value: 0.0478 % Grade Count:209
Beryllium, Be	0.0200 - 10.5 %	0.0200 - 10.5 %	Average value: 1.41 % Grade Count:522
Bismuth, Bi	0.000100 - 6.00 %	0.000100 - 6.00 %	Average value: 0.645 % Grade Count:180
Boron, B	0.000100 - 2.50 %	0.000100 - 2.50 %	Average value: 0.134 % Grade Count:61
Cadmium, Cd	0.000100 - 14.5 %	0.000100 - 14.5 %	Average value: 0.482 % Grade Count:92
Calcium, Ca	0.00500 - 0.150 %	0.00500 - 0.150 %	Average value: 0.00943 % Grade Count:44
Carbon, C	0.00500 - 2.00 %	0.00500 - 2.00 %	Average value: 0.213 % Grade Count:79
Chromium, Cr	0.0100 - 96.2 %	0.0100 - 96.2 %	Average value: 0.899 % Grade Count:257
Co + Ni	0.200 - 3.00 %	0.200 - 3.00 %	Average value: 0.320 % Grade Count:287
Co + Ni + Fe	0.600 - 1.90 %	0.600 - 1.90 %	Average value: 0.640 % Grade Count:259
Cobalt, Co	0.0100 - 4.00 %	0.0100 - 4.00 %	Average value: 0.941 % Grade Count:290
Copper, Cu	19.0 - 100 %	19.0 - 100 %	Average value: 85.6 % Grade Count:4660
Gold, Au	2.00 - 50.5 %	2.00 - 50.5 %	Average value: 34.1 % Grade Count:25
Iron, Fe	0.00100 - 30.0 %	0.00100 - 30.0 %	Average value: 0.548 % Grade Count:2655
Lead, Pb	0.000500 - 58.0 %	0.000500 - 58.0 %	Average value: 0.762 % Grade Count:2745
Lithium, Li	0.0400 - 0.0500 %	0.0400 - 0.0500 %	Average value: 0.0457 % Grade Count:49
Magnesium, Mg	0.00200 - 12.0 %	0.00200 - 12.0 %	Average value: 0.282 % Grade Count:184
Manganese, Mn	0.0000500 - 40.0 %	0.0000500 - 40.0 %	Average value: 2.09 % Grade Count:876
Nickel, Ni	0.000 - 50.0 %	0.000 - 50.0 %	Average value: 6.09 % Grade Count:1792
Niobium, Nb (Columbium, Cb)	0.0100 - 1.50 %	0.0100 - 1.50 %	Average value: 0.252 % Grade Count:39
Oxygen, O	0.000500 - 1.10 %	0.000500 - 1.10 %	Average value: 0.0740 % Grade Count:230
Phosphorus, P	0.000300 - 7.80 %	0.000300 - 7.80 %	Average value: 0.311 % Grade Count:1352
Selenium, Se	0.000200 - 1.10 %	0.000200 - 1.10 %	Average value: 0.0762 % Grade Count:104
Silicon, Si	0.00300 - 15.0 %	0.00300 - 15.0 %	Average value: 0.720 % Grade Count:902
Silver, Ag	0.00250 - 68.8 %	0.00250 - 68.8 %	Average value: 2.48 % Grade Count:423
Sulfur, S	0.00100 - 0.650 %	0.00100 - 0.650 %	Average value: 0.114 % Grade Count:201
Tellurium, Te	0.000200 - 0.900 %	0.000200 - 0.900 %	Average value: 0.308 % Grade Count:73

In, Sn	0.000 - 20.0 %	0.000 - 20.0 %	Average value: 2.97 % Grade Count:1850
Titanium, Ti	0.0100 - 43.6 %	0.0100 - 43.6 %	Average value: 1.70 % Grade Count:73
Tungsten, W	40.0 - 55.0 %	40.0 - 55.0 %	Average value: 46.5 % Grade Count:5
WC	50.0 %	50.0 %	Average value: 50.0 % Grade Count:5
Zinc, Zn	-0.900 - 54.0 %	-0.900 - 54.0 %	Average value: 14.8 % Grade Count:2589
Zirconium, Zr	0.00200 - 30.0 %	0.00200 - 30.0 %	Average value: 0.414 % Grade Count:166
