# Stamping Material Selection Guide

## Bend Rating Key:

ESI's Bend Rating scale measures the formability of a material based on its ability to bend or form without tearing or breaking. "Green" designates easier formability all the way through "red" as most difficult.

| | Green | Yellow | Orange | Red |
|---|---|---|---|---|
| | Easy formability | Moderate formability; possible strain | Limited formability; chance of tearing | Difficult formability; likelihood of tearing |
| |  |  |  |  |
| Radii for various thicknesses, whereas "t"=times thickness. | 0t to 3t | 3t to 6t | 6t to 9t | 9t + |

## Copper

| | Summary | Recommended Finishes? | Applications | Conditions Available | Bend Rating | Magnetic? | Tensile Strength Minimum (KSI) | | Elongation Minimum (% 2" Gauge) | Yield Strength Minimum (0.2% offset) | | Hardness (Min-Max) | Density (lb/cu in) | | Corrosion Resistance | Cost? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | KSI | MPa | | KSI | MPa | | ($lb/in^3$) | ($g/cm^3$) | | |
| **110** | C110 is comprised of 99.9% pure copper. It is extremely ductile with high electrical conductivity, outstanding thermal conductivity, and high resistance to soil corrosion. | Tin, Nickel, Electroless Nickel, Sliver | Bus Bars, welding fixtures, anodes, ground straps, plumbing fitting, electrical components | 110 Copper Annealed | Green | No | 26 | 179 | 45% | 10 | 69 | 15T 47-57 | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C110 1/4 Hard | Green | No | 36 | 248 | 25% | 28 | 193 | Rockwell B 25 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C110 1/2 Hard | Yellow | No | 40 | 276 | 22% | 34 | 234 | Rockwell B 40 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C110 Hard | Yellow | No | 48 | 331 | 12% | 43 | 296 | Rockwell B 50 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C110 Extra Hard | Orange | No | 53 | 365 | 6% | 48 | 331 | Rockwell B 60 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C110 Spring | Orange | No | 55 | 379 | 4% | 51 | 352 | Rockwell B 62 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| **194** | C194 is a first generation high performance alloy used around the world. It combines excellent electrical conductivity with high tensile strength, good solderability, and plateability. It appears in applications such as semiconductor pins and leadframes, connectors, sockets, and mass terminations. | Tin, Nickel, Electroless Nickel, Sliver | Connectors, semiconductor pins and leadframes, sockets, mass terminations | C194 Annealed | Green | No | 40 | 276 | 26% | 36 | 248 | Rockwell B 40 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C194 1/4 Hard | Green | No | 45 | 310 | 23% | 21 | 145 | Rockwell B 48 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C194 1/2 Hard | Yellow | No | 53 | 365 | 17% | 43 | 296 | Rockwell B 52 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C194 Hard | Yellow | No | 60 | 414 | 7% | 58 | 400 | Rockwell B 61 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C194 Extra Hard | Orange | No | 67 | 462 | 3% | 65 | 448 | Rockwell B 67 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C194 Spring | Red | No | 70 | 483 | 2% | 68 | 469 | Rockwell B 68 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| **195** | Alloy C195 is a high strength, high electrical conductivity copper alloy. With a balanced combination of strength and conductibity, this alloy is used in an array of applications, including electrical hardware. It allows parts to be reduced in size without forgoing performance. | Tin, Nickel, Electroless Nickel, Sliver | Electrical hardware, spring terminal applications | C195 Annealed | Green | No | 50-60 | 345-414 | 26% | 28 | 193 | Rockwell B 50 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C195 1/4 Hard | Green | No | 60-72 | 414-496 | 14% | 57 | 393 | Rockwell B 61 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C195 1/2 Hard | Yellow | No | 68-78 | 469-538 | 6% | 71 | 490 | Rockwell B 69 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C195 3/4 Hard | Yellow | No | 75-85 | 517-586 | 3% | 77 | 531 | Rockwell B 72 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C195 Hard | Orange | No | 82-90 | 565-621 | 2% | 83 | 572 | Rockwell B 73 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |
| | | | | C195 Spring | Red | No | 88-97 | 607-669 | 2% | 88 | 607 | Rockwell B 74 Min | 0.322 | 8.913 | 2 of 4 | $$$$ |

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