Laird

TECH NOTES

LAIRD TECHNOLOGIES

#116

ADVANTAGES OF FIXTURE HEAT TREATED BERYLLIUM COPPER

By: Manny Cambria

Beryllium Copper Alloy C17200 hardened after blanking and forming is the best material available for spring applications requiring good conductivity, strength, stability and accuracy. Beryllium Copper obtains its spring characteristics from a precipitation hardening heat treatment which not only gives it excellent spring properties, but also relieves the internal stresses induced by cold rolling and cold forming. As a result of this low temperature heat treatment, Beryllium Copper springs are very stable and maintain their position and spring force over a wide range of temperature and stress.

The performance of Beryllium Copper springs is not greatly influenced by grain direction, as is true with most cold worked materials. It is well suited, therefore, for bending with the grain to obtain economical use of precious metal inlays and to permit furnishing the springs in continuous strips for cost saving in handling, inspection, sub-assemblies, etc.

Of great concern to both spring manufacturers and spring users, is the lack on uniformity of bends resulting from non-uniform "spring-back" of the material in the forming dies. There is usually spring-back variation in the same lot, and even the same coil of material. The higher the yield point (indicating greater cold work) and the larger the forming radius, the greater the spring-back, and hence the greater variations in the spring-back.

With fixture heat treated Beryllium Copper, the adverse effects of cold rolling and cold forming on the finished part are reduced because of their confinement in the fixture plus the stress-relieving aspects associated with the heat treating process.

Heat-treat fixtures should be designed such that they constrain the part to control key or critical features and dimensions and to correct problems such as coil set, twist, and cross bow. The design should also allow parts to be placed in the fixture in strips or side-by-side in single pieces.

The hardening cycle is a relatively low temperature treatment and does not normally require special atmosphere or controlled cooling.

The advantages of fixture heat treating become obvious: highly reliable precision parts of consistent form, strength and stability. This is a "must" in this era of high technology, SPC and on time delivery.

There are some cases where acceptable results may be obtained with "BULK" heat treatment as a substitute for fixture heat treatment. While both methods can produce parts of equal strength and stability, the bulk method will produce greater variations in formed dimensions because of spring-back and distortion in heat treatment. If the dimensional control of the part is not as critical as would be required for fixtured parts, the saving resulting from less individual handling, increased production, elimination of fixture costs makes the bulk process an attractive alternative to the fixtured process.

In summary, it can be said that Beryllium Copper springs heat treated in fixtures after forming are superior to any other spring material when compared on the combined basis of strength, electrical conductivity, stability, and accuracy. The chart below indicates hardness which can readily be obtained using the fixture method of heat treating Beryllium Copper springs.

Material - Alloy C17200 Beryllium Copper

	thickness of stock in.	temper before hardening	Rockwell■ 15N min.	dph● min. at 500 g load
recommended hardness specifications alloy 25	.0149 to .0125 incl.	A 1/4H 1/2H H	76 77 77.5 78	325 338 343 353
	.0124 to .011 incl.	A 1/4H 1/2H H	75.5 76.5 77 77.5	325 338 343 353
	.0109 to .010 incl.	A 1/4H 1/2H H	75 76 76.5 77	325 338 343 353
	.0099 to .0085 incl.	A 1/4H 1/2H H	74.5 75.5 76 76.5	325 338 343 353
	.0084 to .003 incl.	A 1/4H 1/2H H	— — — —	325 338 343 353

● DPH = Diamond Pyramid Hardness (or Vickers)
■ Corrected for Thinness Effect

North America: 1.800.843.4556 **Scotland**: +44.1355.248248 **France**: +33.1.6949.7979 **Germany**: +49.8031.24600 +49.3081.872800
China: +86.7552.7072412 +86.2266.298160 +86.5126.5151368 +86.21.6442.8018
Japan: +81.3354.20666 **Singapore**: +65.6243.8022 **Taiwan**: +886.3312.9292
www.lairdtech.com ● **e-mail:sales@lairdtech.com**