



Temper Designations

Temper is defined as the metallurgical condition and properties of a product resulting from thermal or mechanical processing treatments. Temper designations for copper and copper alloys can be found in ASTM B 601.

In wire, the nominal temper designation is usually related directly to the amount of cold reduction (cold work) stated in terms of American Wire Gauge (AWG) gauge numbers. In the AWG gauge system each gauge corresponds to the adjacent gauge sizes by a fixed ratio. As the gauge numbers increase, the thickness (gauge) of the wire decreases by 10.9% and the area decreases by 20.7% for each gauge step. Thermal processing (heat treating) of the wire can be done at any time in the processing cycle to produce the properties desired.

Flat wire, like strip, is rolled flat in thickness only. Accordingly, the tensile strengths of flat wire are similar to strip. Other copper alloy wire shapes: square, round, rectangular or special, realize by their processing a reduction of thickness as well as a reduction in width. This causes a greater corresponding reduction in cross sectional area. As a result, these wire shapes have higher tensile strength values for the same standard temper designations. Hence, the existence of different tables of mechanical properties for wire and strip in the technical literature.

Temper Designation			Flat Wire	Round or Square Wire	
ASTM	Nomenclature	Increase in AWG Gauge Numbers	Reduction in Thickness %	Reduction in Size %	Reduction in Area %
H01	1/4 Hard	1	10.9	10.9	20.7
H02	1/2 Hard	2	20.7	20.7	37.1
H03	3/4 Hard	3	29.4	29.4	50.1
H04	Hard	4	37.1	37.1	60.5
H06	Extra Hard	6	50.1	50.1	75.1
H08	Spring	8	60.5	60.5	84.4
H10	Extra Spring	10	68.6	68.6	90.2
H12	Special Spring	12	75.1	75.1	93.8
H14	Super Spring	14	80.3	80.3	96.1

It is to be noted that the greater cross sectional area reduction realized in wire processing narrows the spread between tensile and yield strength. Tensile strength then becomes the primary specification parameter in wire with yield and elongation used as reference values. Additionally, flat wire sections with a 3:1 width to thickness ratio or less are by commercial convention processed to the same tensile strength values as round or square wire.

Because of the different mechanical properties found in different shapes of copper alloy wire, it is advised to always specify the desired tensile range for wire whether or not a standard temper designation is used.

The information provided on this page is for reference purposes only.

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