

ASTM B151 / ASME SB151

Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar

This specification establishes the requirements for copper-nickel-zinc and copper-nickel rod and bar for general application produced from Copper Alloy UNS Nos. C70600, C70620, C71 500, C71 520, C74500, C75200, C75700, C76400, C77000, and C79200.

Copper Alloys UNS Nos. C70620 and C71520 are for product intended for welding applications.

A. General Requirements :-

1. The following sections of Specifications B249/B249M are a part of this specification:
 - i. Material and Manufacture,
 - ii. Test Methods.

B. Chemical Composition :-

The product shall conform to the chemical compositional requirements prescribed in Table 1.

Table 1^A

Copper Alloy UNS No.	Copper, Incl Silver	Nickel, Incl Cobalt	Lead	Iron	Manganese	Zinc	Phosphorous	Sulfur	Carbon
C70600	remainder	9.0-11.0	0.05	1.0-1.8	1.0	1.0	0.02	0.02	...
C70620	86.5 min	9.0-11.0	0.02	1.0-1.8	1.0	0.50	0.02	0.02	0.05
C71500	remainder	29.0-33.0	0.05	0.40-1.0	1.0	1.0	...	...	...
C71520	65.0 min	29.0-33.0	0.02	0.40-1.0	1.0	0.50	0.02	0.02	0.05
C74500	63.5-66.5	9.0-11.0	0.05	0.25	0.50	remainder	...	...	...
C75200	63.0-66.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C75700	63.5-66.5	11.0-13.0	0.05	0.25	0.50	remainder	...	...	...
C76400	58.5-61	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C77000	53.5-56.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C79200	59.0-66.5	11.0-13.0	0.8-1.4	0.25	0.50	remainder	...	...	...

^A Composition, % max (unless shown as range or min).

C. Temper :-

1. The standard tempers available under this specification and as defined in Classification B601 are: O60, OS015, OS035, OS070, M30, H01, and H04 are given in Tables 2-5.

D. Grain Size :-

1. Product in the OS temper shall conform to the grain size requirement prescribed in Table 2 for the specified copper alloy and temper.

E. Tensile Strength Requirement :-

1. Copper-Nickel-Zinc Alloys UNS Nos. C74500, C75200, C75700, C76400, C77000, and C79200 in Tempers H01 and H04 shall conform to the requirement prescribed in Table 3
2. Copper-Nickel Alloys UNS Nos. C70600, C70620, C71500, and C71520 in Tempers H01, H04, M30, and O60 shall conform to the requirement prescribed in Tables 4 and 5.

TABLE 2: Grain Size Requirements for OS (Annealed) Temper Rod and Bar

Copper Alloy UNS No.	Temper Designation	Grain Size, mm		
		Nominal	Minimum	Maximum
All alloys	OS015	0.015	...	0.03
All alloys	OS035	0.035	0.025	0.050
C74500, C75200, C75700, C76400, and C77000	OS070	0.070	0.050	0.10

TABLE 3: Tensile Requirements for Copper-Nickel-Zinc Alloy Rod and Bar

Temper Designation	Diameter or Distance Between Parallel Surfaces, in. [mm]	Tensile Strength, ksi [MPa]			
		Copper Alloy UNS Nos. C75200 and C79200		Copper Alloy UNS Nos. C74500, C75700, C76400, and C77000	
		Min	Max	Min	Max
H01	Rod: round				
	0.02 to 0.50 [0.5 to 10], incl	60 [415]	80 [550]	75 [515]	95 [655]
H04	Rod: round, hexagonal, octagonal				
	0.02 to 0.25 [0.5 to 6.5], incl	80 [550]	100 [690]	90 [620]	110 [760]
	Over 0.25 to 0.50 [6.5 to 10], incl	70 [485]	90 [620]	80 [550]	100 [690]
	Over 0.50 to 1.0 [10 to 25], incl	65 [450]	85 [590]	75 [515]	95 [655]
	Over 1.0 [25]	60 [415]	80 [550]	70 [485]	90 [620]
H04	Bar: square, rectangular				
	all sizes	68 [470]	88 [605]	75 [515]	95 [650]

TABLE 4: Tensile Requirements for Copper-Nickel Alloy Rod and Bar [Inch-Pound Units]

Temper Designation	Diameter or Distance Between Parallel Surfaces, in.		Tensile Strength, min, ksi	Yield Strength at 0.5 % Extension Under Load, min, ksi	Elongation in 4× Diameter or Thickness of Specimen, min, % ^A
Copper Alloy UNS Nos. C70600 and C70620					
O60, M30	round, hexagonal, and octagonal rods and square bars	all sizes	38	15	30
H04	round, hexagonal, and octagonal rods and square bars	up to 3/8, incl	60	38	10
		over 3/8 to 1, incl	50	30	15
		over 1 to 3, incl	40	15	30
O60	rectangular bars and shapes	over 3 to 5, incl	38	15	20
		all sizes	38	15	30
		For Thicknesses:			
H04	rectangular bars	up to 3/8, incl	55	30	10
		over 3/8 to 1/2, incl	50	28	12
		over 1/2 to 3	40	17	20
H04	shapes	all sizes	(As agreed upon between the manufacturer or supplier and the purchaser)		
Copper Alloy UNS Nos. C71500 and C71520					
O60, M30	round, hexagonal, and octagonal rods and square bars	up to 1/2, incl	52	18	30
		over 1/2 to 1, incl	48	18	30
		over 1	45	18	30
H01	round, hexagonal, and octagonal rods and square bars	up to 1/2, incl	65	50	10
		over 1/2 to 1, incl	60	45	15
		over 1 to 3, incl	55	35	20
		over 3 to 5, incl	45	18	20
H04		up to 1/2, incl	80	60	8
		over 1/2 to 1, incl	75	58	10
		over 1 to 2, incl	70	55	10
O60	rectangular bars and shapes	all sizes	45	15	30
		For Thicknesses:			
		up to 1/2, incl	75	55	7
		over 1/2 to 1, incl	70	50	10
H04	shapes	all sizes	(As agreed upon between the manufacturer or supplier and the purchaser)		

TABLE 5: Tensile Requirements for Copper-Nickel Alloy Rod and Bar [SI Units]

Temper Designation	Diameter or Distance Between Parallel Surfaces, mm.		Tensile Strength, min, MPa	Yield Strength at 0.5 % Extension Under Load, min, Mpa	Elongation in 4× Diameter or Thickness of Specimen, min, %^A
Copper Alloy UNS Nos. C70600 and C70620					
O60, M30	round, hexagonal, and octagonal rods and square bars	all sizes	260	105	30
H04	round, hexagonal, and octagonal rods and square bars	up to 9.5, incl	415	260	10
		over 9.5 to 25, incl	345	205	15
		over 25 to 80, incl	275	105	30
O60	rectangular bars and shapes	over 80 to 125, incl	260	105	20
		all sizes	260	105	30
		For Thicknesses:			
H04	rectangular bars	up to 9.5, incl	380	205	10
		over 9.5 to 12, incl	345	195	12
		over 12 to 80, incl	275	115	20
H04	shapes	all sizes	(As agreed upon between the manufacturer or supplier and the purchaser)		
Copper Alloy UNS Nos. C71500 and C71520					
O60, M30	round, hexagonal, and octagonal rods and square bars	up to 12, incl	360	125	30
		over 12 to 25, incl	330	125	30
		over 25	310	125	30
H01	round, hexagonal, and octagonal rods and square bars	up to 12, incl	450	345	10
		over 12 to 25, incl	415	310	15
		over 25 to 80, incl	380	240	20
		over 80 to 125, incl	310	125	20
H04	rectangular bars and shapes	up to 12, incl	550	415	8
		over 12 to 25, incl	515	400	10
		over 25 to 50, incl	485	380	10
O60	rectangular bars and shapes	all sizes	310	105	30
		For Thicknesses:			
H04	rectangular bars	up to 12, incl	515	380	7
		over 12 to 25, incl	485	345	10
H04	shapes	all sizes	(As agreed upon between the manufacturer or supplier and the purchaser)		

F. Test Methods :-

1. Chemical Analysis—Chemical composition shall be determined, in case of disagreement, as follows:

Element	Range, %	Method
Copper	53–90	E478
Iron	0.02–8	E75
Lead	0.05–1.5	E478 (AA)
Manganese	0.05–1.0	E75
Nickel	8–34	E478 (Gravimetric)
Zinc	0–1.0	E478 (AA)
Zinc	2–40	E478 (Titrimetric)
Sulfur	0–0.1	E478 (AA)
Phosphorus	0–1.0	E478 (AA)
Carbon	0.01–1.0	E76

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