

ASTM B127 / ASME SB127

SPECIFICATION FOR NICKEL-COPPER ALLOY (UNS N04400) PLATE, SHEET, AND STRIP

This specification covers rolled nickel-copper alloy (UNS N04400) plate, sheet, and strip.

A. Chemical Composition :-

The material shall conform to the requirements as to chemical composition prescribed in Table 1.

Table 1

Element	Alloy N04400
	Composition, %
Nickel, min ^A	63
Copper	28.0 to 34.0
Iron, max	2.5
Manganese, max	2
Carbon, max	0.3
Silicon, max	0.5
Sulfur, max	0.024

^A Element shall be determined arithmetically by difference.

B. Mechanical Properties :-

- The material shall conform to the requirements for mechanical properties prescribed in Table 2.
- Deep-Drawing and Spinning Quality Sheet and Strip — The material shall conform to the requirements for grain size and hardness properties prescribed in Table 3.

Table 2

Condition (Temper)	Tensile Strength, min, psi (MPa)	Yield Strength ^A (0.2% offset), min, psi (MPa)	Elongation in 2 in. or 50 mm, or 4D, min, %	Rockwell Hardness (B Scale) ^{B,C}
Hot-Rolled Plate				
Annealed	70000 (485)	28000 (195)	35	...
As-rolled ^{D,E}	75000 (515)	40000 (275)	25	...
Hot-Rolled Sheet				
Annealed	70000 (485)	28000 (195)	35	...
Cold-Rolled Sheet				
Annealed	70000 to 85000 (485 to 585)	28000 (195)	35	...
Quarter-hard	...	...	...	73 to 83
Half-hard	...	...	...	82 to 90
Hard	100000 (690)	90000 (620)	2	...
Cold-Rolled Strip				
Annealed	70000 to 85000 (485 to 585) ^F	28000 (195)	35 ^F	...
Skin hard	...	...	...	68 to 73
Quarter-hard	...	...	...	73 to 83
Half-hard	...	...	...	82 to 90
Three-quarter-hard	...	...	...	89 to 94
Hard	100000 (690) ^F	90000 (620)	2 ^F	...
Spring temper	...	...	...	98 min

^A Yield strength requirements do not apply to material under 0.020 in. (0.51 mm) in thickness.

^B For Rockwell or equivalent hardness conversions see Hardness Conversion Tables E 140.

^C Caution should be observed in using the Rockwell test on thin material, as the results may be affected by specimen thickness. For thicknesses under 0.050 in. (1.3 mm), the use of the Rockwell superficial or the Vickers hardness test is suggested.

^D As-rolled plate may be given a stress-relieving heat treatment subsequent to final rolling.

^E As-rolled plate specified "suitable for hot forming" shall be furnished from heats of known good hot-malleability characteristics (see X1.2.2). There are no applicable tensile or hardness requirements for such material.

^F Not applicable for thickness under 0.010 in. (0.25 mm).

Table 3

Thickness, in. (mm)	Calculated Diameter of Average Grain Section, max		Corresponding ASTM Micro- Grain Size No.	Rockwell B ^{A,B} Hardness, max
	mm	in.		
Sheet (56 in. (1420 mm) Wide and Under)				
0.050 (1.3) and under	0.075	0.0030	4.5	76
Over 0.050 to 0.250 (1.3 to 6.4) , incl	0.110	0.0043	3.5	76
Strip (12 in. (305 mm) Wide and Under) ^C				
0.005 ^D to 0.015 (0.13 to 0.38) , incl	0.022	0.0009	8 ^E	76 ^E
Over 0.015 to 0.024 (0.38 to 0.61) , incl	0.060	0.0024	5.5	76
Over 0.024 to 0.125 (0.61 to 3.2) , incl	0.075	0.0030	4.5	76

^A For Rockwell or equivalent hardness conversions see Hardness Conversion Tables E 140.

^B Caution should be observed in using the Rockwell test on thin material as the results may be affected by specimen thickness. For thicknesses under 0.050 in. (1.3 mm), the use of the Rockwell superficial or the Vickers hardness test is suggested.

^C Sheet requirements in Table 4 apply to strip thicknesses over 0.125 in. (3.2 mm), and for all thicknesses of strip over 12 in. (305 mm) in width.

^D For ductility evaluations for strip under 0.005 in. (0.13 mm) in thickness, the spring-back test such as described in Test Method F 155 is often used and the manufacturer should be consulted.

^E Accurate grain size and hardness determinations are difficult to make on strip under 0.005 in. (0.13 mm) in thickness and are not recommended.

C. Weight:-

- For calculations of mass or weight a density of 0.319 lb/in.³ (8.83 g/cm³) shall be used.

D. Supplementary Requirements :-

- Chemical Composition:-

The material shall conform to the composition limits specified in Table 1 except as specified in Table 4.

Table 4

Element	Composition Limits, %
Carbon	0.2 max.
Sul fur	0.015 max.
Aluminium	0.5 max.
Lead	0.006 max.
Tin	0.006 max.
Zinc	0.02 max.
Phosphorous	0.02 max.

- Mechanical Properties:-

Mechanical property requirements for quarter hard cold-rolled strip 1/4 in. thick and less shall be as specified in Table 5.

Table 5

Tensile Strength, min, psi (MPa)	78000–85000 (538–586)
Yield Strength, min, psi (MPa) (0.2% offset)	45000 (310)
Elongation in 2 in., 50 mm, or 4D, min, %	20

3. Non-destructive Tests

- i. Ultrasonic Tests:- Ultrasonic testing shall be performed in accordance with MIL-STD-271 as modified by the requirements specified herein.
- ii. Liquid Penetrant Inspection:- Liquid penetrant inspection shall be in accordance with MIL-STD-271.

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