

ASTM B162 / ASME SB162

SPECIFICATION FOR NICKEL PLATE, SHEET, AND STRIP

This specification covers rolled nickel (UNS N02200) and low-carbon nickel (UNS N02201) plate, sheet, and strip.

A. Chemical Compositions :-

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

Table 1

Element	Nickel (UNS N02200)	Low-Carbon Nickel (UNS N02201)
Ni ^A , min	99	99
Cu, max	0.25	0.25
Fe, max	0.4	0.4
Mn, max	0.35	0.35
C, max	0.15	...
C, max	...	0.02
Si, max	0.35	0.35
S, max	0.01	0.01

^A Element shall be determined arithmetically by difference.

B. Mechanical and Other Requirements :-

1. Mechanical Properties :—

The material shall conform to the requirements for mechanical properties prescribed in Table 2.

Table 2

Condition (Temper)	Tensile Strength, min, psi (MPa)	Yield ^A Strength (0.2 % offset), min, psi (MPa)	Elongation in 2 in. or 50 mm, or 4D, min, %	Rockwell Hardness (B Scale) ^{B,C}
Nickel (UNS N02200) Hot-Rolled Plate				
Annealed	55000 (380)	15000 (100)	40	...
As-rolled ^{D,E}	55000 (380)	20000 (135)	30	...
Nickel (UNS N02200) Hot-Rolled Sheet				
Annealed	55000 (380)	15000 (100)	40 ^F	...
Nickel (UNS N02200) Cold-Rolled Sheet				
Annealed	55000 (380)	15000 (100)	40 ^F	...
Quarter-hard	...	...	...	70 to 80
Half-hard	...	...	...	79 to 86
Hard	90000 (620)	70000 (480)	2	...
Nickel (UNS N02200) Cold-Rolled Strip				
Annealed	55000 (380) ^G	15000 (100)	40 ^{F,G}	...
Skin-hard	...	...	...	64 to 70
Quarter-hard	...	...	...	70 to 80
Half-hard	...	...	...	79 to 86
Three-quarter-hard	...	...	...	85 to 91
Hard	90000 (620) ^G	70000 (480)	2 ^G	...
Spring temper	...	...	...	95 min
Low-Carbon Nickel (UNS N02201) Hot-Rolled Plate				

Annealed	50000 (345)	12000 (80)	40	...
As-rolled ^{D,E}	50000 (345)	12000 (80)	30	...
Low-Carbon Nickel (UNS N02201) Hot-Rolled Sheet				
Annealed	50000 (345)	12000 (80)	40 ^F	...
Low-Carbon Nickel (UNS N02201) Cold-Rolled Sheet				
Annealed	50000 (345)	12000 (80)	40 ^F	...
Low-Carbon Nickel (UNS N02201) Cold-Rolled Strip				
Annealed	50000 (345) ^G	12000 (80)	40 ^{F,G}	...

^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. There are no applicable tensile or hardness requirements for such material.

^F Sheet and strip 0.010 to 0.049 in. (0.25 to 1.2 mm), inclusive, in thickness shall have an elongation of 30% minimum. Sheet and strip 0.050 to 0.109 in. (1.3 to 2.7 mm), inclusive, in thickness shall have an elongation of 35% minimum.

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

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 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.		
Nickel(UNS N02200) Sheet [56 in.(1420 mm) Wide and Under] ^C				
0.050 (1.3) and less	0.110	0.0043	3.5	64
Over 0.050 to 0.250(1.3 to 6.4), incl	0.120	0.0047	3.0	64
Nickel(UNS N02200) Strip [12 in.(305 mm) Wide and Under] ^D				
0.005 ^E to 0.010 (0.13 to 0.25), incl	0.025	0.0010	7.5 ^F	70 ^F
Over 0.010 to 0.024 (0.25 to 0.61), incl	0.065	0.0026	5.0	68
Over 0.024 to 0.125 (0.61 to 3.2), incl	0.110	0.0043	3.5	64
Low-Carbon Nickel(UNS N02201) Strip [12 in.(305 mm) Wide and Under] ^D				
0.005 ^E to 0.010 (0.13 to 0.25), incl	0.030	0.0012	7.0 ^F	66 ^F
Over 0.010 to 0.024 (0.25 to 0.61), incl	0.075	0.0030	4.5	64
Over 0.024 to 0.125 (0.61 to 3.2), incl	0.110	0.0043	3.5	64

^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 There are no applicable grain size requirements for low-carbon nickel (UNS N02201) sheet. The hardness of low-carbon nickel (UNS N02201) sheet shall be not over Rockwell B64, or equivalent.

^D 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.

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

^F 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.

3. The mechanical properties of Table 3 do not apply to deep-drawing and spinning quality sheet and strip.

C. Test Methods :-

Determine the chemical composition, mechanical, and other properties of the material as enumerated in this specification, in case of disagreement, in accordance with the following methods:

<u>Test</u>	<u>ASTM Designation</u>
Chemical analysis	E 39
Tension	E 8
Brinell hardness	E 10
Rockwell hardness	E 18
Hardness conversion	E 140
Grain size	E 112
Rounding procedure	E 29
Spring-back	F 155

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