

ASTM B333 / ASME SB 333

SPECIFICATION FOR NICKEL-MOLYBDENUM ALLOY PLATE, SHEET, AND STRIP

This specification covers plate, sheet, and strip of nickel -molybdenum alloys (UNS N10001, N10665, N10675, N10629, and N10624) as shown in Table 1, for use in general corrosive service.

The following products are covered under this specification:

Sheet and Strip — Hot or cold rolled, solution annealed, and descaled unless solution anneal is performed in an atmosphere yielding a bright finish.

Plate — Hot or cold rolled, solution annealed, and descaled.

A. Terminology :-

1. Cold-rolled plate — material 3/16 to 3/8 in. (4.76 to 9.52 mm), inclusive, in thickness.
2. Hot-rolled plate — material 3/16 in. (4.76 mm) and over in thickness.
3. Plate — material 3/16 in. (4.76 mm) and over in thickness.
4. Sheet and strip — material under 3/16 in. (4.76 mm) in thickness.

B. General Requirements :-

1. Material furnished under this specification shall conform to the applicable requirements of Specification B 906 unless otherwise provided herein.

C. Chemical Composition :-

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

Table 1

Element	Alloy N10001	Alloy N10665	Alloy N10675	Alloy N10629	Alloy N10624
Nickel	remainder ^A	remainder ^A	65 min	remainder ^A	Bal
Molybdenum	26.0–30.0	26.0–30.0	27.0–32.0	26.0–30.0	21.0–25.0
Iron	4.0–6.0	2.0 max	1.0–3.0	1.0–6.0	5.0–8.0
Chromium	1.0 max	1.0 max	1.0–3.0	0.5–1.5	6.0–10.0
Carbon, max	0.05	0.02	0.01	0.01	0.01
Silicon, max	1	0.1	0.1	0.05	0.1
Cobalt, max	2.5	1	3	2.5	1
Manganese, max	1	1	3	1.5	1
Phosphorus, max	0.04	0.04	0.03	0.04	0.025
Sulfur, max	0.03	0.03	0.01	0.01	0.01
Vanadium	0.2–0.4	...	0.20 max	...	...
Nickel plus Molybdenum	...	...	94.0–98.0	...	...
Aluminum	...	...	0.50 max	0.1–0.5	0.5
Columbium (Nb), max	...	...	0.2	...	...
Copper, max	...	...	0.2	0.5	0.5
Tantalum, max	...	...	0.2	...	...
Titanium, max	...	...	0.2	...	...
Tungsten, max	...	...	3	...	...
Zirconium, max	...	...	0.1	...	...
Magnesium, max	...	...	...	...	...

^A See Specification B 906.

D. Mechanical Properties and Other Requirements :-

1. Tensile Properties — The material shall conform to the room temperature tensile properties prescribed in Table 2.
2. Hardness — The hardness values given in Table 2 are informative only.

Table 2

Alloy	Thickness, in. (mm)	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % Offset), min, psi (MPa)	Elongation in 2 in. (50.8 mm) or 4D ^A min, %	Rockwell, Hardness, ^B max
Sheet and Strip					
N10001	Under 3/16 (4.76)	115 000 (795)	50 000 (345)	45	100 HRB
N10665	Under 3/16 (4.76)	110 000 (760)	51 000 (350)	40	100 HRB
N10675	Under 3/16 (4.76)	110 000 (760)	51 000 (350)	40	100 HRB
N10629	Under 3/16 (4.76)	110 000 (760)	51 000 (350)	40	100 HRB
N10624	Under 3/16 (4.76)	104 000 (720)	46 000 (320)	40	100 HRB
Plate					
N10001	3/16 to 2 1/2 in. (4.76 to 63.5 mm), incl	100 000 (690)	45 000 (310)	40	100 HRB
N10665	3/16 to 2 1/2 in. (4.76 to 63.5 mm), incl	110 000 (760)	51 000 (350)	40	100 HRB
N10675	3/16 to 2 1/2 in. (4.76 to 63.5 mm), incl	110 000 (760)	51 000 (350)	40	100 HRB
N10629	3/16 to 2 1/2 in. (4.76 to 63.5 mm), incl	110 000 (760)	51 000 (350)	40	100 HRB
N10624	3/16 to 2 1/2 in. (4.76 to 63.5 mm), incl	104 000 (720)	46 000 (320)	40	100 HRB

^A D refers to the diameter of the tension specimen.

^B Hardness values are shown for information purposes only and are not to be used as a basis for rejection or acceptance. For approximate hardness conversions, see Hardness Conversion Tables E 140.

3. Grain Size for Sheet and Strip — Sheet and strip shall conform to the grain sizes as illustrated in Plate 1 of Test Methods E 112. The requirements shall be as indicated in Table 3.

Table 3

Thickness, in. (mm)	ASTM Micro grain Size Number, max	Average Grain Diameter, max, mm (in.)
0.125 (3.175) and under	3.0	0.127 (0.0050)
Over 0.125 (3.175)	1.5	0.214 (0.0084)

E. Weight :-

For calculations of mass or weight, the following densities shall be used:

Alloy	Density lb/in. ³ (g/cm ³)
N10001	0.334 (9.24)
N10665	0.333 (9.22)
N10675	0.333 (9.22)
N10629	0.333 (9.22)
N10624	0.322 (8.9)

F. Length :-

1. Sheet and Strip — Sheet and strip may be ordered to cut lengths, in which case a variation of 1/8 in. (3.175 mm) over the specified length shall be permitted, with a 0 minus tolerance.

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