

# ASTM B335 / ASME SB335

## SPECIFICATION FOR NICKEL-MOLYBDENUM

### ALLOY ROD

This specification covers rod 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:

Rods 5/16 to 3/4 in. (7.94 to 19.05 mm) excl in diameter, hot or cold finished, solution annealed and pickled or mechanically descaled.

Rods 3/4 to 3(1/2) in. (19.05 to 88.9 mm) incl in diameter, hot or cold finished, solution annealed, ground or turned.

#### A. 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	Remainder	65.0min.	Remainder	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	0.1	0.1	0.05	0.1
1.0Cobalt, max	1.0	1.0	3.0	2.5	1.0
Manganese, max	1.0	1.0	3.0	1.5	1.0
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	...	...	3.0	...	...
Zirconium, max	...	...	0.1	...	...
Magnesium, max	...	...	...	...	...

#### B. Mechanical Properties and Other Requirements :-

The mechanical properties of the material at room temperature shall conform to those shown in Table 2.

**Table 2**

Alloy	Thickness, in. (mm)	Tensile Strength, Min., psi (MPa)	Yield Strength (0.2% Offset), Min., psi (MPa)	Elongation in 2 in. (50 mm) or 4D <sup>A</sup> , Min. %	Rockwell Hardness, Max
N10001	5/16 to 1(1/2) (7.94 to 38.1) incl	115 000 (795)	46 000 (315)	35	
	Over 1(1/2) to 3(1/2) (38.1 to 88.9) incl	100 000 (690)	46 000 (315)	30	
N10665	5/16 to 3(1/2) (7.94 to 88.9) incl	110 000 (760)	51 000 (350)	40	
N10675	5/16 to 3(1/2) (7.94 to 88.9) incl	110 000 (760)	51 000 (350)	40	
N10629	5/16 to 3(1/2) (7.94 to 88.9) incl	110 000 (760)	51 000 (350)	40	100 HRB
N10624	5/16 to 3(1/2) (7.94 to 88.9) incl	104 000 (720)	46 000 (320)	40	100 HRB

<sup>A</sup> *D* refers to the diameter of the tension specimen.

**C. Length :-**

1. Unless multiple, nominal, or cut lengths are specified, random mill lengths shall be furnished.
2. The permissible variations in length of multiple, nominal, or cut length rod shall be as prescribed in Table 3.

**Table 3**

Random mill lengths	2 to 12 ft (610 to 3,660 mm) long with not more than 25 weight % under 4 ft (1.22 m).
Multiple lengths	Furnished in multiples of a specified unit length, within the length limits indicated above. For each multiple, an allowance of 1/4 in. (6.35 mm) shall be made for cutting, unless otherwise specified. At the manufacturer's option, individual specified unit lengths may be furnished.
Nominal lengths	Specified nominal lengths having a range of not less than 2 ft (610 mm) with no short lengths allowed.
Cut lengths	A specified length to which all rods shall be cut with a permissible variation of +1/8 in. (3.17 mm) -0.

**D. Weight :-**

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

<u>Alloy</u>	<u>Density</u>	
	<u>lb/in<sup>3</sup></u>	<u>g/cm<sup>3</sup></u>
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

**E. Test Methods :-**

The chemical composition and mechanical properties of the material as enumerated in this specification shall be determined, in case of disagreement, in accordance with the following ASTM methods:

1. Chemical Analysis — Test Methods E 1473.
2. Tension Test — Test Methods E 8.
3. Method of Sampling — Practice E 55.
4. Determining Significant Places — Practice E 29.

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