

# ASTM B581 / ASME SB581

## Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod

This specification covers rod of Ni-Cr-Fe-Mo-Cu alloys (UNS N06007, N06975, N06985, N06030, and N08031) as shown in Tables 1-3, 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 N06007	Alloy N06975	Alloy N06985	Alloy N06030	Alloy N08031
Nickel	remainder <sup>A</sup>	47.0–52.0	remainder <sup>A</sup>	remainder <sup>A</sup>	30.0–32.0
Chromium	21.0–23.5	23.0–26.0	21.0–23.5	28.0–31.5	26.0–28.0
Iron	18.0–21.0	remainder <sup>A</sup>	18.0–21.0	13.0–17.0	remainder <sup>A</sup>
Molybdenum	5.5–7.5	5.0–7.0	6.0–8.0	4.0–6.0	3.0–7.0
Copper	1.5–2.5	0.70–1.20	1.5–2.5	1.0–2.4	1.0–1.4
Manganese	1.0–2.0	1.0 max	1.0 max	1.5 max	2.0 max
Cobalt, max	2.5	...	5.0 max	5.0 max	...
Carbon, max	0.05	0.03	0.015 max	0.03 max	0.015
Tungsten	1.0 max	...	1.5 max	1.5–4.0	...
Silicon, max	1.0	1.0	1.0 max	0.8 max	0.3
Phosphorus, max	0.04	0.03	0.04 max	0.04 max	0.02
Sulfur, max	0.03	0.03	0.03 max	0.02 max	0.01
Columbium + tantalum	1.75–2.50	...	0.50 max	0.30–1.50	...
Titanium	...	0.7–1.5	...	...	...
Nitrogen	0.15–0.25	...	...	...	...

<sup>A</sup> See point E.1.

### B. Mechanical and Other Requirements :-

The material shall conform to the requirements of Table 2.

**Table 2**

Alloy	Specified Diameter, in. (mm)	Tensile Strength min, psi (MPa)	Yield Strength (0.2 % Offset), min, psi (MPa)	Elongation in 2 in. or 50.8 mm or 4D <sup>A</sup> min
N06007	5/16 to 3/4 (7.94 to 19.05), incl	90000 (621)	35000 (241)	35
	Over 3/4 to 3(1/2) (19.05 to 88.9), incl	85000 (586)	30000 (207)	30
N06975	5/16 to 3(1/2) (7.94 to 88.9), incl	85000 (586)	32000 (221)	40
	N06985	5/16 to 3/4 (7.9 to 19.05), incl	90000 (621)	35000 (241)
Over 3/4 to 3(1/2) (19.05 to 88.9), incl		85000 (586)	30000 (207)	35
N06030	...	85000 (586)	35000 (241)	30
N08031	All sizes	94000 (648)	40000 (276)	40

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

**C. Length :-**

1. The permissible variations in length of finished rods shall be as prescribed in Table 3.
2. Unless otherwise specified, random mill lengths shall be furnished.

**Table 3**

Random mill lengths	2 to 12 ft (61 to 366 cm) long with not more than 25 weight % under 4 ft (122 cm).
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) will 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 (61 cm)
Cut lengths	A specified length to which all rods will be cut with a permissible variation of + 1/8 in. (3.17 mm), - 0.

**D. Weight :-**

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

Alloy	Density	
	lb/in. <sup>3</sup>	g/cm <sup>3</sup>
N06007	0.3	8.31
N06975	0.295	8.17
N06985	0.3	8.31
N06030	0.297	8.22
N08031	0.293	8.10

**E. Test Methods and Chemical Analysis :-**

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 E1473.
2. Tension Test—Test Methods E8.
3. Method of Sampling—Practice E55.
4. Determining Significant Places—Practice E29.

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