ASTM B408 / ASME SB408

Standard Specification for
Nickel-Iron-Chromium Alloy Rod and Bar

This specification covers UNS N08120, UNS N08800, UNS N08810, UNS N08811, and UNS N08890 in the form of hot-worked and cold-worked rod and bar.

Alloy UNS N08800 is normally employed in service temperatures up to and including 1100°F (593°C). Alloys UNS N081 20, UNS N08810, UNS N08811, and UNS N08890 are normally employed in service temperatures above 1100°F (593°C) where resistance to creep and rupture is required, and they are annealed to develop controlled grain size for optimum properties in this temperature range.

A. Heat Treatment :-

1. The final heat treatment of UNS N08120 shall be 2150°F (1177°C) minimum, UNS N08810, 2050°F (1121 °C) minimum, UNS N08811, and UNS N08890, 2100°F (1149°C) minimum.

B. Chemical Composition :-

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

Table 1

Element	Composition Limits, %				
	Alloy N08120	Alloy N08800	Alloy N08810	Alloy N08811	Alloy N08890
Nickel	35.0 min	30.0 min	30.0 min	30.0 min	40.0 min
	39.0 max	35.0 max	35.0 max	35.0 max	45.0 max
Chromium	23.0 min	19.0 min	19.0 min	19.0 min	23.5 min
	27.0 max	23.0 max	23.0 max	23.0 max	28.5 max
Iron	remainder	39.5 min[A]	39.5 min[A]	39.5 min[A]	remainder
Manganese, max	1.5	1.5	1.5	1.5	1.5
Carbon	0.02 min	0.10 max	0.05 to 0.10	0.06 to 0.10	0.06 min
	0.10 max	...	...	...	0.14 max
Copper, max	0.5	0.75	0.75	0.75	0.75
Silicon	1.0	1.0	1.0	1.0	1.0 min
	...	...	...	...	2.0 max
Sulfur, max	0.03	0.015	0.015	0.015	0.015
Aluminum[B]	0.40max	0.15min	0.15min	0.15min	0.05min
	...	0.60max	0.60max	0.60max	0.60max
Titanium[B]	0.20max	0.15min	0.15min	0.15min	0.15min
	...	0.60max	0.60max	0.60max	0.60max
Columbium	0.4min	...	...	...	...
	0.9 max	...	...	...	...
Molybdenum	2.50 max	...	...	...	1.0 min
	...	...	...	...	2.0 max
Niobium	...	...	...	...	0.2 min
	...	...	...	...	1.0 max
Tantalum	...	...	...	...	0.10 min
	...	...	...	...	0.60 max
Phosphorus	0.040 max	...	...	...	...
Tungsten	2.50 max	...	...	...	...
Cobalt, max	3.0	...	...	...	...
Nitrogen	0.15 min	...	...	...	...
	0.30 max	...	...	...	...
Boron	0.010 max	...	...	...	...

[A] *Iron shall be determined arithmetically by difference.*

[B] *Alloy UNS N08811: Al + Ti, 0.85 -1.20*

C. Mechanical Properties and Other Requirements :-

1. Mechanical Properties—The material shall conform to the mechanical properties specified in Table 2.
2. Grain Size—Annealed UNS Alloys N08120, N08810, N08811, and N08890 shall conform to an average grain size of ASTM No. 5 or coarser.

Table 2

Alloy	Condition	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % offset) min, psi (MPa)	Elongation in 2 in. or 50 mm (or 4D), min, %
UNS N08120	Cold-worked and hot-worked, Annealed	90 000 (621)	40 000 (276)	30
UNS N08800	Hot worked, as-hot-worked	80 000 (550)	35 000 (240)	25[A]
	Cold-worked and hot-worked, Annealed	75 000 (515)	30 000 (205)	30
UNS N08810 and UNS N08811	Cold-worked and hot-worked, Annealed	65 000 (450)	25 000 (170)	30
UNS N08890	Cold-worked and hot-worked, Annealed	75 000 (520)	30 000 (205)	35
UNS N08800, UNS N08810 and UNS N08811	Forging quality	B	B	B

[A] *For hot-worked as-hot-worked rectangular bar 5⁄16 in. (7.94 mm) and under in thickness the elongation shall be 20 % min.*

[B] *Forging quality is furnished to chemical requirements and surface inspection only. No tensile properties are required.*

D. Length :-

The permissible variations in length of coldworked and hot-worked rod and bar shall be as prescribed in Table 3.

Random mill lengths:	
Hot-worked	6 to 24 ft (1.83 to 7.31 m) long with not more than 25 weight % between 6 and 9 ft (1.83 and 2.74 m)[A]
Cold-worked	6 to 20 ft (1.83 to 6.1 m) long with not more than 25 weight % between 6 and 1 0 ft (1.83 and 3.05 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. (6.4 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 (610 mm) with no short lengths allowed[B]
Cut lengths	a specified length to which all rods and bars will be cut with a permissible variation of plus 1⁄8 in. (3.2 mm), minus 0 for sizes 8 in. (203 mm) and less in diameter or distance between parallel surfaces. For larger sizes, the permissible variation shall be + 1⁄4 in. (6.4 mm), − 0.

[A] *For hot-worked sections weighing over 25 lb/ft (37 kg/m) and for smooth forged products, all sections, short lengths down to 2 ft (610 mm) may be furnished.*

[B] *For cold-worked rods and bars under 1⁄2 in. (12.7 mm) in diameter or distance between parallel surfaces ordered to nominal or stock lengths with a 2-ft (610 mm) range, at least 93 % of such material shall be within the range specified; the balance may be in shorter lengths but in no case shall lengths less than 4 ft (1220 mm) be furnished.*

E. Test Method :-

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

Test	ASTM Designation
Chemical Analysis	E1473
Tension	E8
Rounding Procedure	E29
Grain Size	E112

Related Keywords

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