

# ASTM B626 / ASME SB626

## Standard Specification for Welded Nickel and Nickel-Cobalt Alloy Tube

This specification covers welded tubes made from the nickel and nickel-cobalt alloys intended for heat exchanger and condenser tubes and tubes for general corrosive service for heat-resisting applications.

This specification covers tube 1/8 to 31/2 in. (3.2 to 88.9 mm) in outside diameter and 0.015 to 0.148 in. (0.41 to 3.7 mm) inclusive, in wall thickness.

### A. Classification :-

1. Five classes of tube are covered as follows:
  - i. Class IA—Welded, sized, solution annealed, and nondestructively tested in accordance with point A.1.i.
  - ii. Class IB—Welded, sized, and solution annealed.
  - iii. Class IIA—Welded, cold worked, solution annealed, and nondestructively tested in accordance with A.1.i.
  - iv. Class IIB—Welded, cold worked, and solution annealed.
  - v. Class III—Welded, cold worked, solution annealed, and nondestructively tested in accordance with A.1.ii.
2. Nondestructive Tests:
  - i. Class IA and Class IIA Tubes—Each finished tube shall be subjected to the hydrostatic test, the pneumatic test, or the eddy current test at the manufacturers option.
  - ii. Class III Tubes—Each finished tube shall be subjected to the pneumatic test and the eddy current test. Tubes larger than 1(1/2) in. (38.1 mm) in outside diameter may be subjected to the hydrostatic test in lieu of the pneumatic test at the manufacturers option.

### B. General Requirements :-

1. Material furnished in accordance with this specification shall conform to the applicable requirements of the current edition of Specification B751 unless otherwise provided herein.

### C. Chemical Composition :-

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

**Table 1**

	Ni	Cr	Mo	Fe	W	C	Si max	Co	Mn	V	P max	S max	Other Components
Ni-Mo Alloys													
N10001	remainder	1.0 max	26.0-30.0	4.0-6.0	...	0.05 max	1	2.5 max	1.0 max	0.2-0.4	0.04	0.03	...
N10665	remainder	1.0 max	26.0-30.0	2.0 max	...	0.02 max	0.1	1.0 max	1.0 max	...	0.04	0.03	...
N10675	65.0 min	1.0-3.0	27.0-32.0	1.0-3.0	3.0 max	0.01max	0.1	3.0 max	3.0max	0.20 max	0.030	0.01	Ti [0.20 max], Cu [0.2 max]

													Al [0.5 max] Zr [0.1max] Cb [0.2 max] Ta [0.2 max] (Ni+Mo) [94.0-98.0]
N10629	remainder	0.5-1.5	26.0-30.0	1.0-6.0	...	0.01max	0.05	2.5 max	1.5max	...	0.04	0.01	Cu [0.5 max] Al [0.1-0.5]
N10624	remainder	6.0-10.0	21.0-25.0	5.0-8.0	...	0.01max	0.1	1.0 max	1.0 max	...	0.025	0.01	Cu [0.5 max]
Ni-Mo-Cr-Fe Alloy													
N10242	remainder	7.0-9.0	24.0-26.0	2.0 max		0.03 max	0.80	1.00 max	0.80 max		0.030	0.015	Cu [0.5 max] Al [0.5 max] B [0.006 max]
Low C Ni-Cr-Mo Alloys													
N10276	remainder	14.5-16.5	15.0-17.0	4.0-7.0	3.0-4.5	0.010 max	0.08	2.5 max	1.0 max	0.35 max	0.04	0.03	...
N06022	remainder	20.0-22.5	12.5-14.5	2.0-6.0	2.5-3.5	0.015 max	0.08	2.5 max	0.5 max	0.35 max	0.02	0.02	...
N06035	remainder	32.25-34.25	7.60-9.00	2.00 max	0.60 max	0.050 max	0.60	1.00 max	0.5 max	0.20 max	0.030	0.015	Cu [0.30 max] Al [0.40 max]
N06455	remainder	14.0-18.0	14.0-17.0	3.0 max	...	0.015 max	0.08	2.0 max	1.0 max	...	0.04	0.03	Ti [0.70 max]
Ni-Cr-Fe-Mo-Cu Alloys													
N06007	remainder	21.0-23.5	5.5-7.5	18.0-21.0	1.0 max	0.05 max	1	2.5 max	1.0-2.0	...	0.04	0.03	Cu [1.5-2.5] (Cb +Ta) [1.75-2.5]
N06975	47.0-52.0	23.0-26.0	5.0-7.0	remainder	...	0.03 max	1	...	1.0 max	...	0.03	0.03	Ti [0.70-1.50] Cu [0.70-1.20]
N06985	remainder	21.0-23.5	6.0-8.0	18.0-21.0	1.5 max	0.015 max	1.0 max	5.0 max	1.0 max	...	0.04	0.03	Cu [1.5-2.5] (Cb +Ta) [0.5 max]
N06030	remainder	28.0-31.5	4.0-6.0	13.0-17.0	1.5-4.0	0.03 max	0.8	5.0 max	1.5 max	...	0.04	0.02	Cu [1.0-2.4] (Cb +Ta) [0.3-1.5]
Ni-Fe-Cr-Mo Alloys													
N08320	25.0-27.0	21.0-23.0	4.0-6.0	remainder	...	0.05 max	1	...	2.5 max	...	0.04	0.03	Ti [4xC min]
Ni-Cr-Mo-Fe Alloys													
N06002	remainder	20.5-23.0	8.0-10.0	17.0-20.0	0.20-1.0	0.05-0.15	1	0.5-2.5	1.0 max	...	0.04	0.03	...
Ni-Fe-Cr-Co Alloy													
R30556	19.0-22.5	21.0-23.0	2.5-4.0	remainder	2.0-3.5	0.05-0.15	0.20-0.80	16.0-21.0	0.50-2.00	...	0.04	0.015	Al [0.10-0.50] Zr [0.001-0.10] La [0.005-0.10]

													N [0.10-0.30] B [0.02 max] Cb [0.30 max] Ta [0.3-1.25]
Ni-Cr-W-Mo Alloys													
N06230	remainder	20.0-24.0	1.0-3.0	3.0 max	13.0-15.0	0.05-0.15	0.25-0.75	5.0 max	0.30-1.00	...	0.03	0.015	Al [0.50 max] La [0.005-0.050] B [0.015 max]
Low C-Ni-Cr-Mo													
N06058	balance	20.0-23.0	19.0-21.0	1.5 max	0.3 max	0.010 max	0.10 max	0.3 max	0.50 max		0.015	0.01	Cu [0.50 max] Al [0.40 max] N [0.02-0.15]
N06059	balance	22.0-24.0	15.0-16.5	1.5 max	...	0.010 max	0.1	0.3 max	0.5 max	...	0.015	0.01	Cu [0.50 max] Al [0.1-0.4]
Low C-Ni-Cr-Mo-Cu Alloy													
N06200	remainder	22.0-24.0	15.0-17.0	3.0 max	...	0.010 max	0.08	2.0 max	0.50 max	...	0.025	0.01	Cu [1.3-1.9] Al [0.50 max]
Low C-Ni-Mo-Cr Alloy													
N10362	remainder	13.8-15.6	21.5-23.0	1.25 max	...	0.010 max	0.08	...	0.60 max	...	0.025	0.01	Al [0.50 max]
Low C-Ni-Fe-Cr-Mo-Cu Alloy													
N08031	30.0-32.0	26.0-28.0	6.0-7.0	balance	...	0.015 max	0.3	...	2.0 max	...	0.02	0.01	Cu [1.0-1.4] N [0.15-0.25]
Low C-Ni-Fe-Cr-Mo-Cu Alloys													
N06686	remainder	19.0-23.0	15.0-17.0	5.0 max	3.0-4.4	0.010 max	0.08	...	0.75 max	...	0.04	0.02	Ti [0.02-0.25]
Ni-Co-Cr-Si Alloy													
N12160	remainder	26.0-30.0	1.0 max	3.5 max	1.0 max	0.15 max	2.4-3.0	27.0-33.0	1.5 max	...	0.03	0.015	Ti [0.20-0.80] Cb [1.0 max]
Cr-Ni-Fe-N Alloy													
R20033	30.0-33.0	31.0-35.0	0.50-2.0	balance	...	0.015 max	0.05	...	2.0 max	...	0.02	0.01	Cu [0.3-1.20] N [0.35-0.60]
Low C-Ni-Mo-Cr-Ta Alloy													
N06210	remainder	18.0-20.0	18.0-20.0	1.0 max	...	0.015 max	0.08	1.0 max	0.5	0.35 max	0.02	0.02	Ta [1.5-2.2]

**D. Mechanical Properties and Other Requirements :-**

1. Mechanical Properties—The material shall conform to the mechanical properties prescribed in Table 2. One test is required for each lot as defined in Specification B751.

**Table 2**

Alloy	Tensile Strength, min, ksi (MPa)	Yield Strength (0.2 Offset) min, ksi (MPa)	Elongation in 2 in. (50.8 mm) or 4D <sup>A</sup> , min, %
Ni-Mo			
UNS N10001	100 (690)	45 (310)	40
UNS N10665	110 (760)	51 (350)	40
UNS N10675	110 (760)	51 (350)	40
UNS N10629	110 (760)	51 (350)	40
UNS N10624	104 (720)	46 (320)	40
Ni-Mo-Cr-Fe			
UNS N10242	105 (725)	45 (310)	40
Low C Ni-Cr-Mo			
UNS N10276	100 (690)	41 (283)	40
UNS N06022	100 (690)	45 (310)	45
UNS N06035	85 (586)	35 (241)	30
UNS N06455	100 (690)	40 (276)	40
Ni-Cr-Fe-Mo-Cu			
UNS N06007	90 (621)	35 (241)	35
UNS N06975	85 (586)	32 (221)	40
UNS N06985	90 (621)	35 (241)	45
UNS N06030	85 (586)	35 (241)	30
Ni-Fe-Cr-Mo			
UNS N08320	75 (517)	28 (193)	35
Ni-Cr-Mo-Fe			
UNS N06002	100 (690)	40 (276)	35
Ni-Fe-Cr-Co			
UNS R30556	100 (690)	45 (310)	40
Ni-Cr-W-Mo			
UNS N06230 <sup>B</sup>	110 (760)	45 (310)	40
Low C-Ni-Cr-Mo			
UNS N06058	110 (760)	52 (360)	40
UNS N06059	100 (690)	45 (310)	45
Low C-Ni-Cr-Mo-Cu			

UNS N06200	100 (690)	45 (310)	45
Low C-Ni-Mo-Cr			
UNS N10362	105 (725)	45 (310)	40
Low-carbon Ni-Fe-Cr-Mo-Cu			
UNS N0803	194 (650)	40 (276)	40
Low C-Ni-Cr-Mo-W			
UNS N06686	100 (690)	45 (310)	45
Ni-Co-Cr-Si			
UNS N12160	90 (620)	35 (240)	40
Low Carbon Cr-Ni-Fe-N			
UNS R20033	109 (750)	55 (380)	40
Low-C Ni-Mo-Cr-Ta			
UNS N06210	100 (690)	45 (310)	45

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

<sup>B</sup> *Solution annealed at a minimum temperature of 2200°F (1204°C) followed by a water quench or rapidly cooled by other means.*

2. Flattening Test Requirements—
  - i. One test is required for each lot as defined in Specification B751.
3. Flange Test Requirements—
  - i. One test is required for each lot as defined in Specification B751.
4. Flange Test Requirements—
  - i. One test is required for each lot as defined in Specification B751.
5. Hydrostatic Test—
  - i. When tested by the manufacturer, each tube shall be subjected to the hydrostatic test per Specification B751.
6. Pneumatic Test—
  - i. When tested by the manufacturer, each tube shall be subjected to the pneumatic test per Specification B751.
7. Eddy Current Test—
  - i. When tested by the manufacturer, each tube shall be subjected to an electromagnetic (eddy current) test per Specification B751.

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