



Designation: **B704 – 03 (Reapproved 2014) B704 – 19**

Standard Specification for Welded ~~UNS N06625, UNS N06219 and UNS N08825~~ Nickel Alloy Tubes¹

This standard is issued under the fixed designation B704; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope ~~Scope~~*

1.1 This specification covers welded UNS N06219, UNS N06625, ~~UNS N06219~~ ~~UNS N08825~~, and ~~UNS N08825~~ ~~UNS N08827~~ nickel alloy boiler, heat exchanger, and condenser tubes for general corrosion resisting and low or high-temperature service.

1.2 This specification covers tubes $\frac{1}{8}$ to 5 in. (3.18 to 127 mm), inclusive, in outside diameter and 0.015 to 0.500 in. (0.38 to 12.70 mm), inclusive, in wall thickness. Specification B751 lists the dimensional requirements of these sizes. Tubes having other dimensions may be furnished provided such tubing complies with all other requirements of this specification.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

B751 Specification for General Requirements for Nickel and Nickel Alloy Welded Tube
E8 Test Methods for Tension Testing of Metallic Materials [Metric] E0008_E0008M

3. Ordering Information

3.1 Orders for material to this specification should include the following information:

3.1.1 Quantity (feet or number of lengths),

3.1.2 UNS number,

3.1.3 Size (outside diameter, minimum or average wall thickness),

3.1.4 Length (random or specific),

3.1.5 Class, and

3.1.6 Grade if UNS N06625 is specified. If neither grade of N06625 is specified, grade 1 will be supplied.

3.1.7 ASTM designation.

3.1.8 *Product Analysis*—State if required.

~~3.1.9 *Certification*—State if a certification or a report of test results is required.~~

3.1.9 *Purchaser Inspection*—State which tests or inspections are to be witnessed, if any.

4. Materials and Manufacture

4.1 Tube shall be made from flat-rolled alloy by an automatic welding process with no addition or filler metal. Subsequent to welding and prior to final annealing, the material shall be cold-worked in either the weld metal only or both weld and base metal.

¹ This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

4.2 Tube shall be furnished with oxide removed. When bright annealing is used, descaling is not necessary.

5. Chemical Composition

5.1 The material shall conform to the composition limits specified in **Table 1**. One test is required for each lot as defined in Specification **B751**.

5.2 If a product analysis is performed, it shall meet the chemistry limits prescribed in **Table 1**, subject to the analysis tolerances of Specification **B751**.

6. Mechanical and Other Properties

6.1 *Mechanical Properties*—The material shall conform to the mechanical property requirements specified in **Table 2**. One test is required for each lot as defined in Specification **B751**.

6.2 *Flattening Test*—A flattening test shall be made on each end of one tube per lot. Superficial ruptures resulting from surface imperfections shall not be cause for rejection.

6.3 *Flange Test*—A flange test shall be made on each end of one tube per lot.

6.4 *Nondestructive Test Requirements:*

6.4.1 *Class 1*—Each piece in each lot shall be subject to one of the following four tests: hydrostatic, pneumatic (air underwater), eddy current, or ultrasonic.

6.4.2 *Class 2*—Each piece in each lot shall be subjected to a leak test and an electric test as follows:

6.4.2.1 *Leak Test*—Hydrostatic or pneumatic (air underwater).

TABLE 1 Chemical Requirements

	Composition Limits, %		
	UNS N06625	UNS N06219	UNS N08825
Ni	58.0 min ^A	Bal	38.0–46.0
Cr	20.0–23.0	18.0–22.0	19.5–23.5
Fe	5.0 max	2.0–4.0	22.0 min ^A
Mo	8.0–10.0	7.0–9.0	2.5–3.5
Cb + Ta	3.15–4.15	...	...
C	0.10 max	0.05 max	0.05 max
Mn	0.50 max	0.50 max	1.0 max
Si	0.5 max	0.70–1.10	0.5 max
P	0.015 max	0.020 max	...
S	0.015 max	0.010 max	0.03 max
Al	0.4 max	0.50 max	0.2 max
Ti	0.40 max	0.50 max	0.6–1.2
Co (if determined)	1.0 max	1.0 max	...
Cu	...	0.50 max	1.5–3.0

TABLE 1 Chemical Requirements^A

	Composition Limits, %			
	UNS N06219	UNS N06625	UNS N08825	UNS N08827
Nickel	Bal ^B	58.0 min ^B	38.0–46.0	39.0–43.0
Chromium	18.0–22.0	20.0–23.0	19.5–23.5	21.0–23.0
Iron	2.0–4.0	5.0	22.0 min ^B	Bal ^B
Molybdenum	7.0–9.0	8.0–10.0	2.5–3.5	4.5–6.5
Columbium (Nb) + Tantalum	...	3.15–4.15	...	...
Carbon	0.05	0.10	0.05	0.015
Manganese	0.50	0.50	1.0	0.5–0.9
Silicon	0.70–1.10	0.5	0.5	0.2–0.5
Phosphorous	0.020	0.015	...	...
Sulfur	0.010	0.015	0.03	0.005
Aluminum	0.50	0.4	0.2	0.06–0.25
Titanium	0.50	0.40	0.6–1.2	...
Cobalt (if determined)	1.0	1.0	...	0.5
Copper	0.50	...	1.5–3.0	1.6–2.3
Nitrogen	...	...	...	0.03
Columbium (Nb)	...	...	...	0.15
Boron	...	...	...	0.002–0.004
Magnesium	...	...	...	0.006–0.015

^A Maximum unless range or minimum is given. Where ellipses (...) appear in this table, there is no requirement and analysis for the element need not be determined or reported.

^B Element may be determined arithmetically by difference.