



Designation: **B516 – 18 B516 – 24**

## Standard Specification for Welded Nickel-Chromium-Aluminum Alloy (~~UNS N06699~~) and Nickel-Chromium-Iron Alloy (~~UNS N06600, UNS N06601,~~ ~~UNS N06603, UNS N06025, UNS N06045, UNS N06690, and~~ ~~UNS N06693) Tubes<sup>1</sup>~~

This standard is issued under the fixed designation B516; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This specification covers welded UNS N06600,<sup>2</sup> N06601, N06603, N06025, N06045, UNS N06690, UNS N06693, and UNS N06699 alloy boiler, heat exchanger, and condenser tubes for general corrosion resisting and low or high-temperature service.

1.2 This specification covers tubes  $\frac{1}{8}$  in. to 5 in. (3.18 to 127 mm), (3.18 mm to 127 mm), inclusive, in outside diameter and  $\frac{0.015}{0.015}$  in. to 0.500 in. ( $\frac{0.38}{0.38}$  mm to 12.70 mm), inclusive, in wall thickness. Table 2 of 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 Safety Data Sheet (SDS) 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:<sup>3</sup>

- B751 Specification for General Requirements for Nickel and Nickel Alloy Welded Tube
- B899 Terminology Relating to Non-ferrous Metals and Alloys

### 3. Terminology

3.1 Terms defined in Terminology B899 shall apply unless defined otherwise in this standard.

<sup>1</sup> 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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<sup>2</sup> Designation established in accordance with ASTM E527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

<sup>3</sup> 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

### 3.1 Definitions:

3.1.1 For definitions of terms used in this specification, refer to Terminology **B899**.

3.1.2 In case of conflict between the definitions of this specification and Terminology **B899**, this specification shall prevail.

## 4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for the safe and satisfactory performance of material ordered under this specification. Examples of such requirements include, but are not limited to, the following:

4.1.1 Quantity (feet or number of lengths),

4.1.2 UNS number,

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

4.1.4 Length (random or specific),

4.1.5 Class,

4.1.6 ASTM designation,

4.1.7 *Product Analysis*—State if required, and

4.1.8 *Certification*—State if a certification or a report of test results is required, and

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

**TABLE 1 Chemical Requirements<sup>A</sup>**

Element	Composition Limits, %							
	N06600	N06601	N06603	N06025	N06045	N06690	N06693	N06699
Nickel <sup>A</sup>	72.0 min	58.0-63.0	Bal	Bal	45.0 min	58.0 min	Bal	Bal
Nickel <sup>B</sup>	72.0 min	58.0-63.0	Bal	Bal	45.0 min	58.0 min	Bal	Bal
Chromium	14.0 min 17.0 max	21.0-25.0	24.0-26.0	24.0-26.0	26.0-29.0	27.0-31.0	27.0-31.0	26.0-30.0
Iron	6.0 min	Bal <sup>A</sup>	8.0-11.0	8.0-11.0	21.0-25.0	7.0-11.0	2.5-6.0	2.5 max
Iron	6.0 min 10.0 max	Bal <sup>B</sup>	8.0-11.0	8.0-11.0	21.0-25.0	7.0-11.0	2.5-6.0	2.5
Manganese	1.0 max	1.0 max	0.15 max	0.15 max	1.0 max	0.5 max	1.0 max	0.50 max
Manganese	1.0	1.0	0.15	0.15	1.0	0.5	1.0	0.50
Carbon	0.15 max	0.10 max	0.04-0.08	0.15-0.25	0.05-0.12	0.05 max	0.15 max	0.005-0.10
Carbon	0.15	0.10	0.04-0.08	0.15-0.25	0.05-0.12	0.05	0.15	0.005-0.10
Copper	0.5 max	1.0 max	0.50 max	0.10 max	0.3 max	0.5 max	0.5 max	0.50 max
Copper	0.5	1.0	0.50	0.10	0.3 max	0.5	0.5	0.50
Silicon	0.5 max	0.5 max	0.50 max	0.5 max	2.5-3.0	0.5 max	0.5 max	0.50 max
Silicon	0.5	0.5	0.50	0.5	2.5-3.0	0.5	0.5	0.50
Sulfur	0.015 max	0.015 max	0.010 max	0.010 max	0.010 max	0.015 max	0.01 max	0.01 max
Sulfur	0.015	0.015	0.010	0.010	0.010	0.015	0.01	0.01
Aluminum	...	1.0-1.7	2.4-3.0	1.8-2.4	...	...	2.5-4.0	1.9-3.0
Titanium	...	...	0.01-0.25	0.1-0.2	...	...	1.0 max	0.60 max
Titanium	...	...	0.01-0.25	0.1-0.2	...	...	1.0	0.60
Niobium	...	...	...	...	...	...	0.5-2.5	0.50 max
Niobium	...	...	...	...	...	...	0.5-2.5	0.50
Phosphorus	...	...	0.020 max	0.02 max	0.02 max	...	...	0.02 max
Phosphorus	...	...	0.020	0.02	0.02	...	...	0.02
Zirconium	...	...	0.01-0.40	0.01-0.10	...	...	...	0.10 max
Yttrium	...	...	0.01-0.15	0.05-0.12	...	...	...	...
Cerium	...	...	...	...	0.03-0.09	...	...	...
Nitrogen	...	...	...	...	...	...	...	0.05 max
Nitrogen	...	...	...	...	...	...	...	0.05

<sup>A</sup> Values in the table are maximums, unless a range or a minimum is indicated.

<sup>B</sup> Element-Element shall be determined arithmetically by difference.