Designation: B834 – 22

Standard Specification for Pressure Consolidated Powder Nickel Alloy Pipe Flanges, Fittings, Valves, and Parts[1]

This standard is issued under the fixed designation B834; 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*

1.1 This specification covers pressure consolidated powder metallurgy nickel alloy pipe flanges, fittings, valves, and parts intended for general corrosion or heat-resisting service.

1.1.1 UNS N06625 products are furnished in two grades of different heat-treated conditions:

1.1.1.1 Grade 1 (annealed)—Material is normally employed in service temperatures up to 1100 °F (593 °C).

1.1.1.2 Grade 2 (solution annealed)—Material is normally employed in service temperatures above 1100 °F (593 °C) when resistance to creep and rupture is required.

1.2 UNS N08367 products are furnished in the solution annealed condition.

1.3 UNS N06600 products are furnished in the annealed condition.

1.4 UNS N06690 products are furnished in the annealed condition.

1.5 UNS N07718 products are furnished in the solution annealed + precipitation hardened condition.

1.6 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.

1.7 The following safety hazards caveat pertains only to test methods portions, Sections 7.3 and 13, of this specification: *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 to determine the applicability of regulatory limitations prior to use.*

1.8 *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]

B899 Terminology Relating to Non-ferrous Metals and Alloys

E3 Guide for Preparation of Metallographic Specimens

E8/E8M Test Methods for Tension Testing of Metallic Materials

E1473 Test Methods for Chemical Analysis of Nickel, Cobalt and High-Temperature Alloys

G28 Test Methods for Detecting Susceptibility to Intergranular Corrosion in Wrought, Nickel-Rich, Chromium-Bearing Alloys

G48 Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution

2.2 *Manufacturer's Standardization Society of the Valve and Fittings Industry Standard:*[3]

SP-25 Standard Marking System for Valves, Fittings, Flanges, and Unions

2.3 *ASME/ANSI Standard:*[4]

ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings

ASME Boiler and Pressure Vessel Code

Section I

Section III

Section IV

[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.

[3] Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602, http://www.mss-hq.com.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, http://www.asme.org.

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

Section VIII
Section XII
ASME B31.1 Power Piping
ASME B31.3 Process Piping

3. Terminology

3.1 *Definitions of Terms:*

3.1.1 The terms and definitions of Terminology B899 apply.

4. Ordering Information

4.1 Orders for material under this specification should include the following information:

4.1.1 Quantity (weight or number of pieces),

4.1.2 Name of material or UNS number,

4.1.3 Grade (UNS N06625)—See 1.1.1, 5.2.1, and Table 3,

4.1.3.1 If neither grade of UNS N06625 is specified, Grade 1 (annealed) will be supplied.

4.1.4 ASTM designation and year of issue,

4.1.5 Inspection (14.1),

4.1.6 Whether rough part or finish machined (7.2.2),

4.1.7 Certification—State if certification is required (16.1),

4.1.8 Supplementary requirements, when applicable, and

4.1.9 If possible, the intended end use.

5. Materials and Manufacture

5.1 *Manufacturing Practice:*

5.1.1 Compacts shall be manufactured by placing a single powder blend into a can, evacuating the can, and sealing it. The can material shall be selected to ensure that it has no deleterious effect on the final product. The entire assembly shall be heated and placed under sufficient pressure for a sufficient period of time to ensure that the final consolidated part is fully dense. The compact may represent one part or a number of parts may be machined from it.

5.1.2 The powder shall be produced by vacuum melting followed by gas atomization.

5.1.3 When powder from more than one heat is used to make a blend, the heats shall be thoroughly mixed to ensure homogeneity.

5.1.4 Powder shall be protected during storage to prevent the detrimental pick-up of oxygen and other contaminants.

5.2 *Heat Treatment:*

5.2.1 Alloy N06625 shall be supplied in either:

5.2.1.1 *Grade 1*—The annealed condition. At the option of the producer, the anneal may be a separate operation following consolidation or may be part of the consolidation process. In either case, the temperature shall be 1600 °F (871 °C) minimum, or

5.2.1.2 *Grade 2*—The solution annealed condition. At the option of the producer, the anneal may be a separate operation following consolidation or may be part of the consolidation process. In either case, the temperature shall be 2000 °F (1093 °C) minimum.

5.2.2 Alloy N08367 shall be supplied in the solution annealed condition.

5.2.2.1 The heat treatment shall consist of heating to a minimum temperature of 2025 °F and quenching in water or rapidly cooling by other means.

5.2.3 Alloy N06600 shall be supplied in the annealed condition. The temperature shall be 1750 °F (954 °C) minimum, A.C. or faster.

5.2.4 Alloy N06690 shall be supplied in the annealed condition. The temperature shall be 1950 °F (1066 °C) minimum, with a minimum holding time of 30 min. The material shall be water quenched.

5.2.5 Alloy N07718 shall be supplied in the solution + precipitation hardened condition. The recommended solution temperature is 1700 to 1850 °F (924 to 1010 °C) hold ½ h minimum, cool at rate equivalent to air cool or faster. The precipitation hardening treatment is 1325 ± 25 °F (718 ± 14 °C). Hold at temperature for 8 h, furnace cool to 1150 ± 25 °F (621 ± 14 °C), hold until total precipitation heat treatment time has reached 18 h, and air cool.

6. Chemical Composition

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

TABLE 1 Chemical Requirements

Element	Composition,%				
	UNS N06625	UNS N08367	UNS N06600	UNS N06690	UNS N07718
Carbon, max	0.10	0.030	0.15	0.05	0.08
Manganese, max	0.50	2.00	1.0	0.5	0.35
Silicon, max	0.50	1.00	0.5	0.5	0.35
Phosphorus, max	0.015	0.040	...	...	0.015
Sulfur, max	0.015	0.030	0.015	0.015	0.015
Chromium	20.00 to 23.00	20.00 to 22.00	14.0 to 17.0	27.0 to 31.0	17.0 to 21.0
Molybdenum	8.00 to 10.00	6.00 to 7.00	...	...	2.80 to 3.30
Nickel	58.0 min[A]	23.50 to 25.50	72.0 min	58.0 min	50.0 to 55.0
Iron	5.00 max	remainder[A]	6.0 to 10.0	7.0 to 11.0	remainder[A]
Cobalt	1.00 max	...	...	...	1.0 max
Niobium[C]	3.15 to 4.15	...	...	...	4.75 to 5.50[B]
Aluminum	0.50 max	...	...	...	0.20 to 0.80
Titanium	0.40 max	...	...	...	0.65 to 1.15
Nitrogen	...	0.18 to 0.25	...	...	...
Copper	...	0.75 max	0.5 max	0.5 max	0.30 max

[A] Element shall be determined arithmetically by difference.
[B] Niobium + tantalum.
[C] The terms niobium (Nb) and columbium (Cb) are alternate names for the same element.