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Standard Specification for Pressure Consolidated Powder Metallurgy Iron-Nickel-Chromium-Molybdenum (UNS N08367) and Nickel-Chromium-Molybdenum-Columbium (Nb) (UNS N06625) Alloy Pipe Flanges, Fittings, Valves, and Parts[1]

This standard is issued under the fixed designation B 834; 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 iron-nickel-chromium-molybdenum (UNS N08367) and nickel-chromium-molybdenumcolumbium (Nb) (UNS N06625) pipe flanges, fittings, valves, and parts intended for general corrosion or heat-resisting service.

1.2 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.

1.3 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 Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E 8 Test Methods for Tension Testing of Metallic Materials

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys

G 28 Test Methods for Detecting Susceptibility to Intergranular Corrosion in Wrought, Nickel-Rich, Chromium-Bearing Alloys

G 48 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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *can*, *n*—the container used to encapsulate the powder during the pressure consolidation process; it is removed from the final part.

3.1.2 *compact*, *n*—the consolidated powder from one can; it may be used to make one or more parts.

3.1.3 *fill pin*, *n*—the part of the compact in the spout used to fill the can; it is not usually integral to the part produced.

3.1.4 *part*, *n*—a single item coming from a compact, either prior to or after machining.

3.1.5 *powder blend*, *n*—a homogeneous mixture of powder from one or more heats; it is limited to the amount that can be mixed in the same blender at one time.

3.1.6 *rough part*, *n*—the part prior to final machining.

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 Microstructure examination, if required (5.1.4),

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 Supplementary requirements, when applicable, and

4.1.8 If possible, the intended end use.

[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.

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 When specified on the order, a section of the compact may be sectioned and the microstructure examined to show porosity and other internal imperfections. This is usually performed on the fill pin. In such cases, the section location and the question of acceptable and unacceptable microstructure shall be agreed upon by the manufacturer and the purchaser.

5.2 *Heat Treatment*:

5.2.1 Alloy N06625 shall be supplied in 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 1800°F 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.

6. Chemical Composition

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

6.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations prescribed in Table 2.

TABLE 1 Chemical Requirements

Element	Composition,%	
	UNS N06625	UNS N08367
Carbon, max	0.10	0.030
Manganese, max	0.50	2.00
Silicon, max	0.50	1.00
Phosphorus, max	0.015	0.040
Sulfur, max	0.015	0.030
Chromium	20.00 to 23.00	20.00 to 22.00
Molybdenum	8.00 to 10.00	6.00 to 7.00
Nickel	58.0 min[A]	23.50 to 25.50
Iron	5.00 max	balance[A]
Cobalt (when specified)	1.00 max	...
Columbium (Nb)	3.15 to 4.15	...
Aluminum	0.50 max	...
Titanium	0.40 max	...
Nitrogen	...	0.18 to 0.25
Copper	...	0.75 max

[A] Element shall be determined arithmetically by difference.

TABLE 2 Product Analysis Tolerance

Element	Tolerance, Over the Maximum Limit or Under the Minimum Limit, %	
	UNS N06625	UNS N08367
Carbon, max	0.01	0.005
Manganese, max	0.03	0.04
Silicon, max	0.03	0.05
Phosphorus, max	0.005	0.005
Sulfur, max	0.003	0.005
Chromium	0.25	0.25
Molybdenum	0.15	0.15
Nickel	0.35	0.25
Iron	0.07	...
Cobalt (when specified)	0.03	...
Columbium (Nb)	0.15	...
Aluminum	0.05	...
Titanium	0.03	...
Nitrogen	...	0.01
Copper	...	0.04

7. Mechanical and Other Requirements

7.1 *Mechanical Properties*—The material shall conform to the requirements for mechanical properties prescribed in Table 3 at room temperature.

7.2 *Hydrostatic Tests*—After machining, valve bodies, fittings, and other pressure-containing parts shall be tested to the hydrostatic shell-test pressures prescribed in ASME/ANSI B16.5 for the applicable steel rating for which the compact is designed, and shall show no leaks. Parts ordered under these specifications for working pressures other than those listed in the American National Standard ratings shall be tested to such pressures as may be agreed upon between the manufacturer and purchaser.

7.2.1 No hydrostatic test is required for welding neck or other flanges.

7.2.2 The compact manufacturer is not required to perform pressure tests on rough parts that are to be finish machined by others. The fabricator of the finished part is not required to pressure test parts that are designed to be pressure containing only after assembly by welding into a larger structure. However, the manufacturer of such parts is responsible as required in 15.1 for the satisfactory performance of the parts under the final test required in 7.2.

7.3 *Density*—The density shall be determined using sample suspended from a scale and weighed in air and water using Archimede's principle. The equipment used shall have accuracy sufficient for the test. The measured value shall not be less than 0.3047 lb/in.^{3}(8.452 gm/cm^3) for UNS N06625 and 0.2904 lb/in.^{3}(8.055 gm/cm^3) for UNS N08367. (See Note 1.)

NOTE 1—The density is a function of alloy variations. Because of this, density differences may be the result of either alloy content or differences in micro-porosity.

7.4 *Microstructure Examination*—Examinations shall show sound and reasonably uniform material, free from injurious

TABLE 3 Mechanical Property Requirements

Alloy	Tensile Strength		Yield Strength		Elongation, min%
	ksi	MPa	ksi	MPa	
N06625	110	758	50	345	30
N08367	95	655	45	310	30