



AEROSPACE MATERIAL SPECIFICATION

AMS5401™

REV. C

Issued 1980-01
Revised 2004-05
Reaffirmed 2023-05

Superseding AMS5401B

Nickel Alloy, Corrosion- and Heat-Resistant, Investment Castings
62Ni - 21.5Cr - 9.0Mo - 3.6Cb (Nb)
Vacuum Melted, Vacuum Cast
As Cast

(Composition similar to UNS N26625)

RATIONALE

AMS5401C has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat-resistant, vacuum melted, nickel alloy in the form of investment castings.

1.2 Application:

These castings have been used typically for structural parts requiring high strength up to 1600 °F (871 °C) and oxidation and corrosion resistance up to 1800 °F (982 °C), but usage is not limited to such applications.

1.3 Classification:

Castings conforming to this specification are classified as follows:

Class 1 - Trace element limits conforming to AMS 2280, Class 1 (AMS 2280-1)
Class 2 - Trace element limits conforming to AMS 2280, Class 2 (AMS 2280-2)
Class 3 - Trace element limits do not apply

1.3.1 Castings shall conform to Class 1 unless Class 2 or Class 3 is specified by purchaser.

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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SAE WEB ADDRESS:

Full document details: SAE AMS5401C

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<https://www.sae.org/standards/content/AMS5401C/>

Documents

Document Sharing Hub

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2175	Castings, Classification and Inspection of
AMS 2269	Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys
AMS 2280	Trace Element Control, Nickel Alloy Castings
AMS 2360	Room Temperature Tensile Properties of Castings
AMS 2694	Repair Welding of Aerospace Castings
AMS 2804	Identification, Castings

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM E 8	Tension Testing of Metallic Materials
ASTM E 8M	Tension Testing of Metallic Materials (Metric)
ASTM E 354	Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys
ASTM E 1417	Liquid Penetrant Examination
ASTM E 1742	Radiographic Examination

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser (See 8.2.1 and 8.2.2).

TABLE 1 - Composition

Element	min	max
Carbon	--	0.10
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	20.00	23.00
Molybdenum	8.00	10.00
Columbium (Niobium) (3.1.1)	3.15	4.15
Cobalt	--	1.00
Titanium (3.1.2)	--	0.40
Tantalum (3.1.1, 3.1.3)	--	0.15
Aluminum (3.1.2)	--	0.40
Iron	--	5.00
Copper	--	0.30
Other Elements (3.1.3)	--	--
Nickel	remainder	

3.1.1 Sum of columbium (niobium) plus tantalum shall not exceed 4.15% by weight.

3.1.2 Shall be present but not in excess of maximum content specified.

3.1.3 Determination not required for routine acceptance.

3.1.4 Vendor may test for any element not otherwise listed in Table 1 and include this analysis in the report of 4.5. Limits of acceptability may be specified by purchaser (See 8.2.3).

3.1.5 Trace Elements: Shall conform to AMS 2280-1 unless AMS 2280-2 or AMS 5401 Class 3 is specified by purchaser (See 1.3).

3.1.6 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2269.

3.2 Melting Practice:

Castings and specimens shall be poured at casting vendor's facility either from a melt (See 8.2.4) of a master heat, or directly from a master heat (See 3.4.2 and 8.2.5).

3.2.1 Revert (gates, sprues, risers, and rejected castings) may be used only in the preparation of master heats; revert shall not be remelted directly without refining for pouring of castings. Melting of revert creates a new master heat.

3.2.1.1 The metal for castings and specimens shall be melted and poured under vacuum without loss of vacuum between melting and pouring. When authorized by purchaser, protective atmosphere may be used in lieu of vacuum for pouring of castings.

3.2.2 Portions of two or more qualified master heats (See 3.4.2) may be melted together and poured into castings using a procedure authorized by purchaser.

3.2.3 If melts (See 8.2.4) are modified by replenishment (See 8.2.7), vendor shall have a written procedure acceptable to purchaser which defines the controls, test, and traceability criteria for both castings and separately-cast specimens. Control factors of 4.4.2.2 shall apply.

3.3 Condition:

Castings shall be delivered in the as-cast condition.

3.4 Test Specimens:

Specimens shall be either separately-cast, integrally-cast (See 8.2. 8), or machined from a casting, and shall conform to 3.2.

3.4.1 If specimens are separately-cast, vendor shall have a written procedure acceptable to purchaser. Control factors of 4.4.2.2 shall apply.

3.4.2 Each master heat shall be qualified by evaluation of chemical and tensile specimens.

3.4.2.1 If replenishments are made at remelt as in 3.2.3, the frequency of sampling and testing used by the vendor for qualification to 3.4.2 shall be acceptable to purchaser.

3.4.2.2 The tensile tests of 3.4.2 are not required if these tests are conducted using integrally-cast specimens (4.3.3.2) or machined-from-casting (4.3.3.3).

3.4.3 Chemical Analysis Specimens: Shall be of any convenient size and shape.

3.4.4 Tensile Specimens: Shall be of standard proportions in accordance with ASTM E 8 or ASTM E 8M (See 8.4) with 0.250-inch (6.35-mm) diameter at the reduced parallel gage section.

3.4.4.1 Separately-cast and integrally-cast specimens may be either cast to size, and/or cast oversize and subsequently machined to 0.250-inch (6.35-mm) diameter.

3.4.4.2 When integrally-cast specimens and specimens machined-from-casting are specified, specimen size and location shall be agreed upon by purchaser and vendor (See 8.2.9 and 8.3).

3.5 Heat Treatment:

Not applicable.