AEROSPACE MATERIAL SPECIFICATION

AMS5385™	REV. J

Issued 1947-09
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Superseding AMS5385H

(R) Cobalt Alloy, Corrosion- and Heat-Resistant,
Investment Castings
62Co - 27Cr - 2.8Ni - 5.5Mo (Stellite® 21)
As-Cast
(Composition similar to UNS R30021)

RATIONALE

AMS5385J is the result of a Five-Year Review and update of the specification. The revision updates the Title to include the commercial name (see 8.5), clarifies CEO approval requirements (see 3.1 and throughout), revises composition test methods (see 3.1), adds strain rate control during tensile testing (see 3.6.2.1.1), adds welding to control operations (see 4.4.2.2), updates and expands reporting, including country of origin identification (see 4.5), addresses use of prior revisions (see 8.4), and adds dimensional inspection to ordering requirements (see 8.6).

1. SCOPE

1.1 Form

This specification covers a corrosion- and heat-resistant cobalt alloy in the form of investment castings.

1.2 Application

These castings have been used typically for parts, such as turbine vanes, requiring high strength up to 1500 °F (816 °C) and oxidation resistance up to 2000 °F (1095 °C), but usage is not limited to such applications.

1.2.1 Exposure to elevated temperatures may cause hardening of these castings (e.g., exposure at approximately 1475 °F [800 °C] for 50 hours may result in hardness as high as 45 HRC).

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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2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2175 Castings, Classification and Inspection of

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

AMS2283 Composition Testing Methods for Nickel- and Cobalt-Based Alloys

AMS2360 Room Temperature Tensile Properties of Castings

AMS2361 Elevated Temperature Tensile Properties of Castings

AMS2694 In-Process Welding of Castings

AMS2804 Identification, Castings

AS7766 Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E18 Rockwell Hardness of Metallic Materials

ASTM E21 Elevated Temperature Tension Tests of Metallic Materials

ASTM E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

ASTM E1417/E1417M Liquid Penetrant Testing

ASTM E1742/E1742M Radiographic Examination

2.3 Definitions

Terms used in AMS are defined in AS7766 and as follows:

INTEGRALLY CAST SPECIMEN: An attached specimen that is cast in the mold and remains with the casting lot through the completion of all heat-treatment operation(s) required of the producer. The casting drawing may identify a specific location for the attachment of each integrally cast specimen.

LOT: For room temperature and elevated temperature tensile testing; a lot shall consist of all castings of the same part number poured from consecutive melts of a single master heat. For visual and nondestructive testing, an inspection lot shall consist of castings of the same part number, manufactured under the same process control parameters of 4.4.2.2, and submitted for those tests in a single group.

MASTER HEAT: Refined metal of a single furnace charge poured directly into castings and/or converted into ingot for remelting in accordance with 3.2. One or more melts can be poured from a master heat. Qualification of a master heat is described in 3.4.2.

MELT: All castings poured from a single furnace charge. Also referred to as remelt, sub-melt, heat, or sub-heat.

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REFINED METAL: Metal derived from raw materials in the form of virgin elements, master alloy, and/or revert melted in any combination, replenished as needed, fluxed for nonmetallics, and degassed as necessary. Melting of revert creates a new master heat.

REPLENISHMENT: Virgin element and/or master alloy additions introduced to the furnace during the final stage of melting, as necessary, to bring the melt or master heat into conformance with the specified composition.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Composition shall conform to the percentages by weight as shown in Table 1, determined in accordance with AMS2283 or by other analytical methods acceptable to the cognizant engineering organization (CEO).

Table 1 - Composition

Element	Min	Max
Carbon	0.20	0.30
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.04
Sulfur	--	0.04
Chromium	25.00	29.00
Nickel	1.75	3.75
Molybdenum	5.00	6.00
Boron	--	0.007
Iron	--	3.00
Other elements (see 3.1.1)	--	--
Cobalt	remainder	

3.1.1 The producer 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 the CEO.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Melting Practice

Castings and specimens shall be poured at the casting producer's facility either from a melt of a master heat or directly from a master heat (see 2.3 and 3.4.2).

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.

3.2.2 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 the CEO.

3.2.3 If melts (see 2.3) are modified by replenishment (see 2.3), the producer shall have a written procedure acceptable to the CEO that 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.

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