



AEROSPACE MATERIAL SPECIFICATION

AMS7006™

Issued

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Nickel Alloy, Corrosion- and Heat-Resistant,
Powder for Additive Manufacturing
52.5Ni - 19Cr - 3.0Mo - 5.1Cb (Nb) - 0.90Ti - 0.50Al - 18Fe
(Composition similar to UNS N07718)

RATIONALE

This purpose of this initial release is to produce a powder specification to cover Alloy 718 for additive manufacturing applications.

1. SCOPE

1.1 Form

This specification covers a corrosion- and heat-resistant nickel alloy in the form of pre-alloyed powder.

1.2 Application

This powder is intended to be used for the additive manufacturing of aerospace parts via a powder bed process that are typically used for parts requiring strength up to 1300 °F (704 °C) and oxidation resistance up to 1800 °F (982 °C), but usage is not limited to such applications.

1.3 Classification

Maximum oxygen concentration is specified as follows:

Class A Oxygen max 500 ppm

Class B Oxygen max 300 ppm

Class C Oxygen max 200 ppm

1.4 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards that may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS

The issue of the following document 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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Documents
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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.

AMS2269	Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys
AMS7002	Process Requirements for Production of Metal Powder Feedstock for Use in Additive Manufacturing of Aerospace Parts
AMS7025	Metal Powder Feedstock Size Classifications
ARP1313	Determination of Trace Elements in High Temperature Alloys
ARP1917	Clarification of 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 B212	Apparent Density of Free-Flowing Metal Powders Using the Hall Flowmeter
ASTM B213	Flow Rate of Metal Powders Using the Hall Flowmeter
ASTM B243	Standard Terminology of Powder Metallurgy
ASTM B417	Standard Test Method for Apparent Density of Non-Free-Flowing Metal Powders Using the Carney Funnel
ASTM B703	Standard Test Method for Apparent Density of Metal Powders and Related Compounds Using the Arnold Meter
ASTM E354	Standard Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys
ASTM E1019	Determination of Carbon, Sulfur, Nitrogen and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques
ASTM E1097	Standard Guide for Determination of Various Elements by Direct Current Plasma Atomic Emission Spectrometry
ASTM/ISO 52900	Additive Manufacturing - General Principles - Terminology

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 E354, by spectrochemical methods in accordance with ASTM E1097, by the methods of ARP1313 for lead, bismuth, and selenium, or by other analytical methods acceptable to purchaser. Carbon, sulfur, oxygen (Table 2), and nitrogen content shall be determined by ASTM E1019.

Table 1 - Composition

	Min	Max
Carbon	-	0.08
Manganese	-	0.35
Silicon	-	0.35
Phosphorus	-	0.015
Sulfur	-	0.015
Chromium	17.00	21.00
Nickel	50.00	55.00
Molybdenum	2.80	3.30
Niobium	4.75	5.50
Titanium	0.65	1.15
Aluminum	0.20	0.80
Cobalt	-	1.00
Tantalum (3.1.1)	-	0.10
Boron	-	0.006
Copper	-	0.3
Lead	-	0.0005 (5 ppm)
Bismuth	-	0.00003 (0.3 ppm)
Selenium	-	0.0003 (3 ppm)
Oxygen	-	See Table 2
Nitrogen	-	0.030
Other Elements, each (3.1.1, 8.10)	-	0.10
Other Elements, total (3.1.1, 8.10)	-	0.50
Iron	-	remainder

Table 2- Oxygen limits based on powder classification

Class	Percent Maximum
A	0.050 (500 ppm)
B	0.030 (300 ppm)
C	0.020 (200 ppm)

3.1.1 Determination not required for routine acceptance with the exception of Hf, Mg, V, W, Zr (see 8.12), which shall be measured but reported collectively, with any other measured elements, as "Other Elements, total."

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Powder Production

Powder shall be manufactured in accordance with AMS7002, with the additional requirements defined in 3.2.1.

3.2.1 Melting

Metal shall be melted in an enclosed vessel under vacuum, argon, or helium gas atmosphere or a fixed, controlled atmosphere as defined in the process control document (PCD) in accordance with AMS7002. An argon or helium gas backfill after pulling vacuum is permissible. Air melting under a cover gas is not permitted. A fixed gas composition primarily comprised (i.e., >50 vol%) of either argon or helium gas, as defined in the PCD, shall be used for metal atomization or powder spheroidization (see 8.12).

3.2.2 Powder Heats and Lots

Powder heats and lots definitions shall be in accordance with AMS7002.