AEROSPACE MATERIAL SPECIFICATION

AMS2269™	REV. G

Issued 1960-01
Reaffirmed 2012-01
Revised 2022-09

Superseding AMS2269F

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

RATIONALE

AMS2269G is the result of a Five-Year Review and update of the specification. The revision updates the definitions and formatting (2.3).

1. SCOPE

1.1 Form

This specification defines limits of variation for determining acceptability of the composition of cast or wrought nickel, nickel alloy, and cobalt alloy parts and material acquired from a producer.

1.1.1 Check analysis limits for elements or for ranges of elements not listed herein shall be as specified in the applicable material specification or as agreed upon by purchaser and vendor.

1.2 Application

1.2.1 When specifically referenced in the material specification, the purchaser may apply check analysis limits to determine the acceptability of parts and materials at purchaser's final acceptance or verification testing operation.

1.2.2 Check analysis limits are not for producer's use at producer's acceptance testing. Composition of parts and materials shall conform to the limits of the material specification. Check limits are not permitted for ladle or ingot analysis.

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.

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.

AS7766 Terms Used in Aerospace Metals Specifications

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS2269G/

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 E55 Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition

ASTM E88 Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

2.3 Definitions

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

CHECK (PRODUCT OR VERIFICATION) ANALYSIS: Analysis made by purchaser of parts and materials to verify the composition of a heat or lot, or to determine variations in composition within a heat or lot. Heat or lot acceptance or rejection of parts and materials may be made by applying check limits. In the analysis of finished parts, check limits do not apply to elements whose percentage can be varied by fabricating techniques employed unless the sample is taken in such a manner as to exclude such variations.

REMAINDER: The basis element from which the alloy is made and is assumed to be present in an amount approximately equal to the difference between 100% and the sum percentage of the alloying elements and listed impurities. It need not be analyzed nor need a percentage figure be reported.

RESIDUAL ELEMENTS, EACH, MAXIMUM: The maximum amount of an individual element not mentioned specifically in the specified composition that may be present. Producer normally will analyze only for elements which are possible to be present because of raw materials or manufacturing processes and which may affect the product significantly. Others will analyze for impurities as they deem necessary.

RESIDUAL ELEMENTS, TOTAL, MAXIMUM: The sum percentage of the residual elements found. It is not inferred by this statement that an analysis need be made for each element of the periodic table not mentioned specifically in the composition section.

VARIATION LIMIT, UNDER MINIMUM OR OVER MAXIMUM: The amount an individual determination for a specified element may vary under or over the specified composition limit. In no case shall the reported determinations of any element in a heat, using the same analytical procedure, vary both above and below the specified range.

3. TECHNICAL REQUIREMENTS

3.1 Analytical Procedures

Referee analysis shall be by any method acceptable to purchaser and vendor.

3.2 Check Analysis Limits

Shall be as shown in Table 1.

Table 1 - Check analysis variation

Element	Limit or Maximum of Specified Element, %	Variation Under Min or Over Max
Carbon	Up to 0.02, incl	0.005
	Over 0.02 to 0.20, incl	0.01
	Over 0.20 to 0.60, incl	0.02
	Over 0.60 to 1.00, incl	0.03
Manganese	Up to 1.00, incl	0.03
	Over 1.00 to 3.00, incl	0.04
	Over 3.00 to 6.00, incl	0.07
	Over 6.00 to 10.00, incl	0.10
Silicon	Up to 0.05, incl	0.01
	Over 0.05 to 0.25, incl	0.02
	Over 0.25 to 0.50, incl	0.03
	Over 0.50 to 1.00, incl	0.05
	Over 1.00 to 4.50, incl	0.10
Phosphorus	All	0.005
Sulfur	Up to 0.02, incl	0.003
	Over 0.02 to 0.06, incl	0.005
Chromium	Up to 5.00, incl	0.10
	Over 5.00 to 15.00, incl	0.15
	Over 15.00 to 25.00, incl	0.25
	Over 25.00 to 35.00, incl	0.30
	Over 35.00 to 45.00, incl	0.40
	Over 45.00 to 50.00, incl	0.50

Table 1 - Check analysis variation (continued)

Element	Limit or Maximum of Specified Element, %	Variation Under Min or Over Max
Nickel	Up to 1.00, incl	0.05
	Over 1.00 to 5.00, incl	0.10
	Over 5.00 to 10.00, incl	0.15
	Over 10.00 to 20.00, incl	0.20
	Over 20.00 to 30.00, incl	0.25
	Over 30.00 to 40.00, incl	0.30
	Over 40.00 to 60.00, incl	0.35
	Over 60.00 to 80.00, incl	0.45
	Over 80.00 to 99.00, incl	0.60
Cobalt	Up to 0.10, incl	0.01
	Over 0.10 to 0.20, incl	0.02
	Over 0.20 to 1.00, incl	0.03
	Over 1.00 to 5.00, incl	0.05
	Over 5.00 to 10.00, incl	0.10
	Over 10.00 to 15.00, incl	0.15
	Over 15.00 to 20.00, incl	0.20
	Over 20.00 to 25.00, incl	0.25
	Over 25.00 to 30.00, incl	0.30
	Over 30.00 to 35.00, incl	0.35
	Over 35.00 to 50.00, incl	0.50
Molybdenum	Up to 1.00, incl	0.03
	Over 1.00 to 3.00, incl	0.05
	Over 3.00 to 5.00, incl	0.10
	Over 5.00 to 20.00, incl	0.15
	Over 20.00 to 30.00, incl	0.25
	Over 30.00 to 35.00, incl	0.35
Tungsten	Up to 1.00, incl	0.04
	Over 1.00 to 3.00, incl	0.10
	Over 3.00 to 5.00, incl	0.15
	Over 5.00 to 10.00, incl	0.20
	Over 10.00 to 20.00, incl	0.25
Columbium (Niobium) and/or Tantalum	Up to 1.50, incl	0.05
	Over 1.50 to 3.00, incl	0.10
	Over 3.00 to 5.00, incl	0.15
	Over 5.00 to 7.00, incl	0.20
	Over 7.00 to 10.00, incl	0.25
	Over 10.00 to 13.00, incl	0.30

Table 1 - Check analysis variation (continued)

Element	Limit or Maximum of Specified Element, %	Variation Under Min or Over Max
Titanium	Up to 0.10, incl	0.02
	Over 0.10 to 0.50, incl	0.03
	Over 0.50 to 1.00, incl	0.04
	Over 1.00 to 2.00, incl	0.05
	Over 2.00 to 3.50, incl	0.07
	Over 3.50 to 5.00, incl	0.10
	Over 5.00 to 10.00, incl	0.20
Aluminum	Up to 0.10, incl	0.02
	Over 0.10 to 0.50, incl	0.05
	Over 0.50 to 2.00, incl	0.10
	Over 2.00 to 5.00, incl	0.20
	Over 5.00 to 10.00, incl	0.25
	Over 10.00 to 15.00, incl	0.30
Boron	Up to 0.01, incl	0.002
	Over 0.01 to 0.05, incl	0.005 (see 3.2.1)
	Over 0.05 to 0.15, incl	0.010
Iron	Up to 0.20, incl	0.02
	Over 0.20 to 0.75, incl	0.03
	Over 0.75 to 2.50, incl	0.05
	Over 2.50 to 5.00, incl	0.07
	Over 5.00 to 10.00, incl	0.10
	Over 10.00 to 15.00, incl	0.15
	Over 15.00 to 30.00, incl	0.30
	Over 30.00 to 50.00, incl	0.45
Copper	Up to 0.20, incl	0.02
	Over 0.20 to 0.50, incl	0.03
	Over 0.50 to 5.00, incl	0.04
	Over 5.00 to 10.00, incl	0.05
	Over 10.00 to 20.00, incl	0.10
	Over 20.00 to 30.00, incl	0.15
	Over 30.00 to 40.00, incl	0.20
	Over 40.00 to 50.00, incl	0.25
	Over 50.00 to 60.00, incl	0.30
	Over 60.00 to 70.00, incl	0.35
	Over 70.00 to 80.00, incl	0.40
Vanadium	Up to 0.50, incl	0.04 (see 3.2.2)
	Over 0.50 to 1.50, incl	0.05