AEROSPACE MATERIAL SPECIFICATION

AMS2249	REV. G

Issued 1961-01
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Superseding AMS2249F

Chemical Check Analysis Limits Titanium and Titanium Alloys

RATIONALE

AMS2249G has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Form

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

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 final acceptance or verification testing operation.

1.2.2 Check analysis limits are not for producers use at producer's acceptance testing. Composition of parts and materials must 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 ASTM Publications

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

ASTM E 539 X-Ray Emission Spectrometric Analysis of 6Al-4V Titanium Alloy
ASTM E 1409 Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Technique
ASTM E 1447 Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity/Infrared Detection Method
ASTM E 1941 Determination of Carbon in Refractory and Reactive Metals and Their Alloys
ASTM E 2371 Analysis of Titanium and Titanium Alloys by Atomic Emission Plasma Spectrometry

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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http://www.sae.org/technical/standards/AMS2249G

3. TECHNICAL REQUIREMENTS

3.1 Analytical Procedures

Referee methods of analysis shall be ASTM E 1409 for oxygen and nitrogen, ASTM E 1447 for hydrogen, and ASTM E 1941 for carbon. Other elements shall be determined by ASTM E 2371, or ASTM E 539 for 6Al–4V.

3.2 Check (Product) Analysis Limits

Shall be shown in Table 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.

TABLE 1 - CHECK ANALYSIS LIMITS

Element	Limits or Maximum of Specified Range, %	Variation Under Min or Over Max
Carbon	Up to 0.20, incl	0.02
	Over 0.20 to 0.50, incl	0.04
	Over 0.50	0.06
Manganese	Up to 0.30, incl	0.10
	Over 0.30 to 6.00, incl	0.20
	Over 6.00 to 9.00, incl	0.25
Chromium	Up to 1.00, incl	0.05
	Over 1.00 to 4.00, incl	0.20
	Over 4.00	0.25
Molybdenum	Up to 0.50, incl	0.04
	Over 0.50 to 1.00, incl	0.10
	Over 1.00 to 10.00, incl	0.20
	Over 10.00 to 30.00, incl	0.25
Aluminum	Up to 1.00, incl	0.12
	Over 1.00 to 10.00, incl	0.40
	Over 10.00 to 30.00, incl	0.50
Hydrogen	Up to 0.020, (200 ppm), incl	0.0020 (20 ppm)
	Over 0.020 to 0.050, (200 to 500 ppm), incl	0.005 (50 ppm)
	Over 0.050 (500 ppm),	0.010 (100 ppm)
Nitrogen	Up to 0.10, (1000 ppm), incl	0.02 (200 ppm)
Oxygen	Up to 0.20, (2000 ppm), incl	0.02 (200 ppm)
	Over 0.20 (2000 ppm)	0.03 (300 ppm)
Iron	Up to 0.25, incl	0.10
	Over 0.25 to 0.50, incl	0.15
	Over 0.50 to 5.00, incl	0.20
	Over 5.00	0.25
Vanadium	Up to 0.50, incl	0.05
	Over 0.50 to 5.00, incl	0.15
	Over 5.00 to 6.00, incl	0.20
	Over 6.00 to 10.00, incl	0.30
	Over 10.00 to 20.00, incl	0.40
Tin	Up to 3.00, incl	0.15
	Over 3.00 to 6.00, incl	0.25
	Over 6.00 to 12.00, incl	0.40
Copper	Up to 1.00, incl	0.05
	Over 1.00 to 3.00, incl	0.10

TABLE 1 - CHECK ANALYSIS LIMITS (CONTINUED)

Element	Limits or Maximum of Specified Range, %				Variation Under Min or Over Max
Zirconium		Up	to	4.00, incl	0.10
	Over	4.00	to	6.00, incl	0.20
	Over	6.00	to	10.00, incl	0.30
	Over	10.00			0.40
Columbium		Up	to	1.00, incl	0.10
	Over	1.00	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	15.00, incl	0.30
	Over	15.00	to	20.00, incl	0.35
	Over	20.00	to	30.00, incl	0.40
Tantalum		Up	to	0.50, incl	0.10
	Over	0.50	to	2.00, incl	0.15
Silicon		Up	to	0.10, incl	0.02
	Over	0.10	to	0.50, incl	0.05
Bismuth		Up	to	0.50, incl	0.05
Yttrium		Up	to	0.005, incl	0.0006
	Over	0.005	to	0.020, incl	0.001
Boron		Up	to	0.005, incl	0.0006
Palladium		Up	to	0.250, incl	0.02
Nickel		Up	to	1.00, incl	0.03
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

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and Testing

For the purpose of determining conformance to the material specification composition requirement, each heat or lot, whichever is applicable, in the shipment shall be considered separately. All samples shall be taken from material in the condition in which it is received, except that all protective surface treatments shall be removed before sampling finished parts. Drillings, chips, and other samples shall be taken without the application of water, oil, or other lubricants and shall be free from scale, grease, dirt, and other foreign materials. Samples shall be taken to prevent alteration of the chemical composition of the sample.

5. PREPARATION FOR DELIVERY

Not applicable.

6. ACKNOWLEDGMENT

Not applicable.

7. REJECTIONS

Not applicable.