AEROSPACE
MATERIAL SPECIFICATIONS

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CHEMICAL CHECK ANALYSIS LIMITS
Titanium and Titanium Alloys

1. PURPOSE: To publish standard chemical check analysis limits as established by AMS usage and to correlate their application and use with material specifications.

2. APPLICATION: The chemical check analysis limits shown herein apply when referenced in the material specification, unless otherwise agreed upon by purchaser and vendor. Check limits not listed herein shall be as agreed upon by purchaser and vendor.

3. DEFINITIONS:

3.1 Check Analysis: An analysis made by purchaser or vendor of the metal after it has been worked into semi-finished or finished forms or fabricated into parts, and is either for the purpose of verifying the composition of a heat or lot or to determine variations in the composition within the heat. Acceptance or rejection of a heat or lot of material or batch of parts may be made by the purchaser on the basis of this check analysis. In the analysis of finished parts, these values do not apply to elements whose percentage can be varied by fabricating techniques employed (for example oxygen, nitrogen, hydrogen) unless the sample is taken in such a manner as to exclude such changes.

3.2 Variation Limit, Under Min or Over Max: Given in Section 6 is the amount an individual determination for a specified element may vary under or over the specified composition limit. In no case shall the several determinations of any element in a heat, using the same analytical procedure, vary both above and below the specified range. These variations are not permitted for ingot analyses made by the producer.

3.3 Remainder: Shows 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.

3.4 Other Impurities (Elements), Each, Max: The maximum amount of an individual element not mentioned specifically in the composition section that may be present. Producer normally will analyze only for impurities 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.

3.5 Other Impurities (Elements), Total, Max: The sum percentage of the impurities (elements) (See 3.4) 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.

3.6 Heat: All metal which, during the final melting operation, is melted and solidified in the same furnace crucible.

3.7 Lot: All material of the same size processed at the same time from the same heat.

4. SAMPLING: 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 in such a manner as to prevent alteration of the chemical composition of the sample, and shall be free from scale, grease, dirt, and other foreign materials. Sampling shall be in accordance with the issue of ASTM E59 specified in the latest issue of AMS 2350, insofar as practicable.

5. ANALYTICAL PROCEDURES: Referee methods of analysis shall be those in the issue of ASTM E120 specified in the latest issue of AMS 2350. Procedures for elements not covered by ASTM E120 shall be as agreed upon by purchaser and vendor.

6. CHECK LIMITS:

Element	Limit or Maximum of Specified Element, %	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	0.15
	Over 4.00	0.25
Molybdenum	Up to 1.00, incl	0.04
	Over 1.00 to 5.00, incl	0.20
	Over 5.00	0.25
Aluminum	Up to 1.00, incl	0.12
	Over 1.00 to 10.00, incl	0.40
Hydrogen	Up to 0.020 (200 ppm), incl	0.0020 (20 ppm)
	Over 0.020 to 0.050 (200 - 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