

AERONAUTICAL MATERIAL SPECIFICATIONS

AMS 2249

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

Issued 1-15-61
Revised

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 shall 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.

including standards approved and practices recommended, are advisory only. Their use is not intended to adhere to any SAE standard or recommended practice, and no commitment is made by the Board and its Committees to investigate or consider, or to be responsible for protecting themselves against liability for infringement of patents.

Section 8.3 of the SAE Technical Board rules provides that: "All technical reports prepared by anyone engaged in industry or trade is entirely voluntary. There is no obligation to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider, or to be responsible for protecting themselves against liability for infringement of patents which may apply to the subject matter. Prospective users of the report are advised to consult their own attorneys for legal advice."

4. SAMPLING: For the purpose of determining conformance to the material specification composition requirement, each heat 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 ASTM E59-57 insofar as practicable.

5. ANALYTICAL PROCEDURES: Referee methods of analysis shall be the latest methods published by Watertown Arsenal/ASTM. Procedures for elements not covered by Watertown/ASTM methods 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	0.20 and under	0.02
	Over 0.20 to 0.50, incl	0.04
	Over 0.50	0.06
Manganese	0.30 and under	0.10
	Over 0.30 to 6.00, incl	0.20
	Over 6.00 to 8.00, incl	0.25
Chromium	1.00 and under	0.05
	Over 1.00 to 4.00, incl	0.15
	Over 4.00	0.25
Molybdenum	1.00 and under	0.04
	Over 1.00 to 5.00, incl	0.20
	Over 5.00	0.25
Aluminum	1.00 and under	0.12
	Over 1.00 to 10.00, incl	0.40
Hydrogen	0.020 (200 ppm) and under	0.0020 (20 ppm) (See Note 1)
	Over 0.020 to 0.050 (200 - 500 ppm), incl	0.005 (50 ppm)
	Over 0.050 (500 ppm)	0.010 (100 ppm)
Nitrogen	0.10 (1000 ppm) and under	0.02 (200 ppm)
Oxygen	0.20 (2000 ppm) and under	0.02 (200 ppm)
	Over 0.20 (2000 ppm)	0.03 (300 ppm)
Iron	0.50 and under	0.15
	Over 0.50 to 5.00, incl	0.20
	Over 5.00	0.25