



AEROSPACE MATERIAL SPECIFICATION

AMS2643™**REV. F**

Issued 1972-11
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Reaffirmed 2023-12

Superseding AMS2643E

(R) Structural Examination of Titanium Alloys
Chemical Etch Inspection Procedure

RATIONALE

AMS2643F results from a Five-Year Review and update of this specification with changes to 3.1.1.1 Bars, Extrusions, Plates, and Stock for Forging or Extruding, 3.4.1.1 Macrostructure Etch, Table 1 Etchant, and 3.4.1.2 Rinse and Dry.

AMS2643F has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

1.1 Purpose

This specification covers a procedure for revealing the macrostructure and microstructure of titanium alloys.

1.2 Application

This inspection procedure has been used typically for detecting defects and segregation in titanium alloys. This procedure should not be used on finished parts.

1.3 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 which may be involved in such use. It is the 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 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.

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Documents

Document Sharing Hub

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.

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

ARP4992 Periodic Test for Processing Solutions

2.2 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B46.1 Surface Texture (Roughness, Waviness and Lay)

2.3 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 D1193 Reagent Water

3. TECHNICAL REQUIREMENTS

3.1 Materials and Solutions

3.1.1 Specimens for Revealing Macrostructure

3.1.1.1 Bars, Extrusions, Plates, and Stock for Forging or Extruding

Specimen cross-sections shall be taken transverse to the grain flow and should have a thickness of not less than 0.50 inch (12.7 mm) thick. Surface roughness shall be of 70 μin (1.8 μm) Ra or less, determined in accordance with ASME B46.1.

3.1.1.2 Forgings

When dimensions permit, forgings shall be rough-machined to clean up and to ensure freedom from alpha case. A minimum of 0.030 inch (0.76 mm) of material shall be left on the surfaces of the forgings between final etching and finish machined configuration to ensure freedom from intergranular attack and hydrogen pickup on finished parts. If forgings are to be inspected by ultrasonic inspection procedures, the configuration used for such inspection is acceptable. Surface roughness shall be 130 μin (3.3 μm) Ra or less, determined in accordance with ASME B46.1.

3.1.2 Specimens for Revealing Microstructure

The specimens on which macrostructure was revealed shall be sectioned through any areas of concern and, also, where practical, shall be sectioned for examination of other planes as needed to provide representative sampling of the product.

3.2 Equipment

3.2.1 The etchant tank, fixtures, racks, and baskets shall be lined/coated with or fabricated from a material that will not react with the etchant (see Table 1).

3.2.2 The tank shall be equipped with exhaust ventilation to vent gases from the vigorous reaction.

3.3 Preparation

Specimens shall be free from water breaks. If water breaks are observed, parts shall be recleaned and reinspected for water break until no water breaks are observed.