



AEROSPACE MATERIAL SPECIFICATION	AMS-H-81200	REV. D
	Issued 2001-04 Revised 2014-07	
	Superseding AMS-H-81200C	
Heat Treatment of Titanium and Titanium Alloys		

RATIONALE

AMS-H-81200D revises the temperature uniformity (3.2.1.7).

NOTICE

The original issue of this document was taken directly from Military Specification MIL-H-81200A and contained only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. Revision A changed the heat treatment requirements for parts from “may be heat treated in accordance with the requirements of AMS2801” to “shall be heat treated in accordance with AMS2801”. As an exception, it allowed continuation of heat treatment procedures for specific parts that had been previously acceptable to the purchaser. It also added the requirement that the heat treat parameters used for heat-treat-response-tests of raw material conform to the parameters used for heat treatment of parts (See 3.1.1).

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

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1. SCOPE

1.1 Purpose

This specification covers the heat treatment of titanium and titanium alloy mill products (raw material), including wrought and cast products, by material producers. This specification also covers furnace equipment requirements, test procedures, and general information for heat treating procedures, heat treating temperatures, and material test procedures for the heat treatment of titanium and titanium alloys. It also describes procedures that, when followed, have produced the desired properties within the limitations of the respective alloys.

1.2 Heat Treatments

The heat treatments covered by this specification are:

Anneal	Solution heat treatment
Beta anneal	Beta solution heat treatment
Recrystallization anneal	Age
Duplex anneal	Stress relief

1.3 Alloys

In addition to Commercially Pure Titanium (Ti40, Ti55, and Ti70), the following titanium alloys are covered by this specification:

Alpha alloys	Alpha-Beta alloys	Beta alloys
5Al-2.5Sn	6Al-4V	13V-11Cr-3Al
5Al-2.5Sn ELI	6Al-4V ELI	3Al-8V-6Cr-4Mo-4Zr
6Al-2Cb-1Ta-0.8Mo	6Al-6V-2Sn	15V-3Al-3Cr-3Sn
8Al-1Mo-1V	3Al-2.5V	10V-2Fe-3Al
	6Al-2Sn-4Zr-2Mo	
	6Al-2Sn-4Zr-6Mo	
	6Al-2Sn-2Zr-2Mo-2Cr-0.25Si	
	5Al-2Sn-2Zr-4Mo-4Cr	
	11Sn-5Zr-2Al-1Mo	

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 724-776-4970 (outside USA), www.sae.org.

AMS2750 Pyrometry

AMS2801 Heat Treatment of Titanium Alloy Parts

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 E 3 Preparation of Metallographic Specimens

ASTM E 8 / E 8M Tension Testing of Metallic Materials

ASTM E 290 Bend Testing Material for Ductility

ASTM E 1447 Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity/Infrared Detection Method

2.3 Order of Precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, shall supersede applicable laws and regulations, unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General

All heating and quenching equipment and procedures applied shall yield products complying with the requirements of appropriate acquisition documents. Equipment and procedures shall be designed to minimize the introduction of hydrogen, oxygen, nitrogen or other contaminants and in any case shall not allow introduction beyond levels established by the acquisition documents. Deviation from process requirements specified herein or the application of processes different from those contained herein, may be used provided that compliant products result, these exceptions have been proven satisfactory, and that they are made known to the purchaser with accompanying data or other justification to support the deviation prior to application of the deviant process.

3.1.1 Heat Treatment of Mill Products and Titanium Alloy Parts

The requirements specified herein are applicable to the heat treatment of mill products (raw material) (See 6.4.1). Producer heat treatment of heat-treat-response-test samples shall conform to AMS2801. Parts (See 6.4.2) shall be heat treated in accordance with AMS2801 except as specified in 3.1.1.1.

3.1.1.1 It is permissible, for specific parts, to use equipment, practices and test methods that conformed to AMS-H-81200 or MIL-H-81200 and were previously acceptable to the purchaser.

3.2 Heating Systems

3.2.1 Batch Furnaces

3.2.1.1 General Requirements

Such furnaces may employ electrical heating elements or fuel combustion as heat sources. Muffle furnaces and retorts are also allowed. Allowable environments surrounding the furnace charge during heating are: inert gas (argon or helium), vacuum, slightly oxidizing mixtures resulting from the combustion in air of hydrocarbons (gas or oil), and air itself. When removal of surface contamination from the heat treated product is not feasible, inert gas or vacuum environment shall be employed. The selection of an atmosphere shall be such as to establish conformance with 3.1.