

AEROSPACE MATERIAL SPECIFICATION



AMS-M-6857A

Issued FEB 1998
Cancelled MAY 2006

Superseded by AMS 2768

Magnesium Alloy Castings,
Heat Treatment of

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This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of May, 2006 and has been superseded by AMS 2768. The requirements of the latest issue of AMS 2768 shall be fulfilled whenever reference is made to the cancelled AMS-H-6857. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications, noting that it has been superseded by AMS 2768.

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1. SCOPE:

1.1 This specification covers the requirements for the heat treatment of magnesium alloy castings. This specification covers furnace equipment requirements, and general information for heat treating procedures and heat treating temperatures for magnesium alloys.

1.2 Alloys:

The following magnesium alloys are covered by this specification (see Table 1):

AM100A
AZ63A
AZ81A
AZ91C
AZ91E
AZ92A
ZK51A
ZK61A
ZE41A
ZE63A
EZ33A
HK31A
HZ32A
ZH62A
EQ21A
QH21A
QE22A
WE54A

2. APPLICABLE DOCUMENTS:

The following publications, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue,
Philadelphia, PA 19111-5094.

MIL-STD-45662 Calibration System Requirements

2.2 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2750 Pyrometry

2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 557 Methods of Tension Testing Wrought and Cast Aluminum and Magnesium Alloy
Products

2.4 Order of precedence:

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

3. TECHNICAL REQUIREMENTS:**3.1 Furnaces:**

Furnaces used for the solution heat treatment and aging of magnesium alloys shall be of the closed chamber type with forced air or protective atmosphere circulation. These furnaces shall be designed to preclude direct radiation from the heating elements or impingement of the flame on the work.

3.1.1 Temperature uniformity: The design and construction of the furnaces shall be such that the temperature in the working zone, for any charge, is capable of being maintained within $\pm 10^{\circ}\text{F}$ ($\pm 6^{\circ}\text{C}$) of the desired heat treating temperature after the charge has been brought up to temperature. At no time shall the temperature in any part of the working zone exceed the maximum permissible temperature for the alloy being heat treated (see Table II). Each furnace used shall be equipped with a separate manual reset safety cutout which will turn off the heat source in the event of any malfunctioning or failure of the regular control equipment. These safety cutouts shall be set as close as practicable above the maximum solution heat treating temperature for the alloy being heat treated. Protective devices shall also be installed to turn off the heat source in case of stoppage of circulation of air.

3.2 Heat control equipment:

3.2.1 Pyrometry and furnace temperature control: The requirements and procedures for control and testing of furnaces, ovens, and allied pyrometric equipment used for heat treatment shall be in accordance with AMS 2750.

3.2.1.1 Temperature-measuring and recording equipment: Location of temperature-measuring and recording instruments shall be in accordance with AMS 2750. The exact location of the temperature-sensing elements will be dependent upon the furnace design. However, they shall be in such a location as to give accurate measurement of the working or soaking, or both, zone temperature.

3.2.1.2 Accuracy: Temperatures shall be adjusted to within $\pm 5^{\circ}\text{F}$ ($\pm 3^{\circ}\text{C}$) of true temperature by applying corrections established by calibrating equipment as specified in 4.3.3.

3.3 Quenching:

Rapid cooling from the solution heat treated condition is required to obtain optimum properties in the castings. The arrangements should be such that the cooling on the various parts of a furnace charge or casting is as uniform as possible.

3.3.1 Air quenching by means of fan cooling can be used if the quench rate is sufficiently rapid to obtain the desired properties.

3.3.2 Water quenching requires the use of a sufficient volume of water in the quench tank to insure that proper quenching rates are attained. Means shall be provided for circulation of the water to give violent agitation during the quench cycle in order to reduce the incidence of steam pockets. Means for heating or cooling to provide the desired water temperature are required.

3.3.2.1 Quenching equipment shall be located in such a manner and handling facilities shall be so arranged and equipped to permit rapid transfer of the load from the furnace to the quenching medium.