



AEROSPACE MATERIAL SPECIFICATION

AMS2759™/3

REV. J

Issued	1984-10
Reaffirmed	2014-04
Revised	2020-05

Superseding AMS2759/3H

Heat Treatment
Precipitation-Hardening Corrosion-Resistant, Maraging, and
Secondary Hardening Steel Parts

RATIONALE

AMS2759/3J changes Tensile (3.4.2), Table 3 notes 5 and 18, and Table 4 note 2.

NOTICE

ORDERING INFORMATION: In addition to that listed in AMS2759, the purchaser shall supply the following information to the heat treating processor:

- AMS2759/3J

1. SCOPE

1.1 Purpose

This specification, in conjunction with the general requirements for steel heat treatment covered in AMS2759, establishes the requirements for heat treatment of precipitation-hardening corrosion-resistant, maraging and secondary hardening, steel parts. Parts are defined in AMS2759. Parts made from steels other than those specified in this specification may be heat treated in accordance with the applicable requirements herein using processing temperatures, times, and other parameters recommended by the material producer unless otherwise specified by the purchaser. General ordering instructions are specified in AMS2759.

1.2 The provisions of this specification revision shall become effective 90 days after publication.

1.3 Application

This specification is applicable to parts made from the steels listed in Table 1.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2020 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://www.sae.org

SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS2759/3J/>

Table 1 - List of steels

Precipitation Hardenable: Martensitic	Precipitation Hardenable: Semi-Austenitic	Precipitation Hardenable: Austenitic	Maraging	Secondary Hardening
15-5 PH	17-7 PH	A-286	Maraging 250	AerMet 100
17-4 PH	PH 15-7 Mo		Maraging 300	AF1410
PH 13-8 Mo	AM 350		Maraging 350	Ferrium M54
Custom 450	AM 355			Ferrium S53
Custom 455				
Custom 465				
MARVAL X12				
MARVAL X12H				
MLX17				

The above designations are trademarks or commercial designations and are for alloy recognition only.

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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2759 Heat Treatment of Steel Parts, General Requirements

ARP1820 Chord Method of Evaluating Surface Microstructural Characteristics

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 A380 Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment, and Systems

ASTM E3 Preparation of Metallographic Specimens

3. TECHNICAL REQUIREMENTS

3.1 Pyrometry

Shall be in accordance with AMS2759 and as specified herein.

3.2 Furnace Equipment

Shall be in accordance with AMS2759 and as follows:

- Furnaces used at temperatures of 1400 °F (760 °C) and higher and for stress relieving: Class 5.
- Furnaces used at temperatures from 1300 to 1375 °F (704 to 746 °C): Class 3.
- Furnaces used at temperatures below 1300 °F (704 °C): Class 2.
- Furnaces shall have a minimum of type D instrumentation in accordance with AMS2750.

3.2.1 Atmospheres

Shall be controlled so as not to contaminate the parts being heat treated. Furnaces used to heat treat other classes of steel using atmospheres that could contaminate precipitation-hardening, maraging, or secondary hardening steel parts, such as endothermic, exothermic, carbon-containing nitrogen-base, etc., shall have purge cycles (see 8.2) run and then shall be tested to ensure that the surfaces of parts are not contaminated beyond the limits specified in 3.4.3. Parts being heat treated shall be suitably isolated from products of combustion. Materials that could attack or contaminate metal shall not contact parts during heat treatment. Composition and maintenance of salt baths shall be such as to prevent contamination of the parts. Salt baths shall be in accordance with AMS2759.

3.2.2 Heating Environment

Type 1 parts shall be heat treated in air or protective atmosphere.

Type 2 parts shall be heat treated in air or protective atmosphere when heating at or below 1450 °F (788 °C) and shall be heat treated in a protective atmosphere when heating above 1475 °F (802 °C).

3.2.2.1 Acceptable protective atmospheres shall be in accordance with AMS2759, and are limited to helium, argon, hydrogen, neutral salt, nitrogen, nitrogen-hydrogen blends, and vacuum in accordance with AMS2769. For scale-free or discoloration-free parts, air atmospheres and air cooling should be avoided.

3.2.2.1.1 Nitrogen and nitrogen-hydrogen blends are permitted below 1475 °F (802 °C). Nitrogen and nitrogen-hydrogen blends are permitted at or above 1475 °F (802 °C) for Type 1 parts only. Nitrogen and nitrogen-hydrogen blends are permitted up to 1975 °F (1079 °C) as a backfill quench for vacuum furnaces. The use of nitrogen from dissociated ammonia is prohibited.

3.2.3 Protective Coatings

A supplemental coating is permitted to minimize oxidation of parts heated in air.

3.3 Procedure

3.3.1 Cleaning

Shall be in accordance with AMS2759.

3.3.2 Start of Soaking

Start of soak shall be in accordance with AMS2759. When a load thermocouple is used it shall be in contact with the thickest cross-section within each furnace load.

3.3.3 Preheating and Normalizing of Secondary Hardening Grades

Parts should be preheated at 1200 to 1250 °F \pm 25 °F (649 to 677 °C \pm 14 °C) for a minimum of 30 minutes before normalizing or solution annealing. Normalizing shall be accomplished by heating to the temperature specified in Table 8, soaking for the time specified in Table 4, and cooling in air or a protective atmosphere to ambient temperature.

3.3.4 Annealing of Secondary Hardening Grades

Shall be accomplished by heating to the temperature and soaking for the time specified in Table 8, and cooling in air or a protective atmosphere to ambient temperature.

3.3.5 Re-Solution of Secondary Hardening Grades

Shall be accomplished by heating to the temperature in Table 3 and soaking for the time specified in Table 4.