



AEROSPACE MATERIAL SPECIFICATION

AMS2759™/10**REV. D**

Issued 1999-05
Reaffirmed 2014-04
Revised 2024-12

Superseding AMS2759/10C

Automated Gaseous Nitriding
Controlled by Nitriding Potential

RATIONALE

AMS2759/10D corrects an error in Composition (see 3.3.1.1), where the minimum hydrogen composition has been changed from 99.985% to 99.95%.

NOTICE

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

- AMS2759/10D
- Engineering drawing or detailed operation information
- Any critical dimensions to be held through nitriding (see 3.4.1.2)
- Prior heat-treatment information, including actual tempering/aging temperature and hardness (see 3.4.1.1)
- Any prior stress relieving performed, including specifics, and if stress relief is to be performed by the nitride processor (see 3.4.1.2)
- Class of compound zone (white layer) depth (thickness) (see 3.1)
- Areas to be nitrided, areas to be masked, areas to be optional (see 3.4.2)
- Total case depth, if applicable (see 3.5.3.2)
- Effective case depth, if applicable (see 3.5.3.3)
- Case (surface) hardness (see 3.5.2)
- Core hardness, if specified (see 3.5.1)
- Areas to be ground after nitride, if applicable (see 3.4.2.3)

SAE Executive Standards Committee 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 © 2024 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, or used for text and data mining, AI training, or similar technologies, 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:

Full document details: SAE AMS2759_10D

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS2759/10D/>

Documents

Standard, visit Sharing Hub

- If parts are to be used for testing (see 4.2.1)
- Post-nitride surface removal requirements, if applicable (see 3.5.3)
- Grind stock allowances to be removed in subsequent grinding, polishing, etc., if applicable (see 3.5.5.2)

1. SCOPE

1.1 Purpose

This document specifies the procedure and requirements for nitriding steel parts in a process automatically controlled by the nitriding potential (see 2.3.6).

1.2 Application

The nitriding process described herein is used typically to produce a nitride case on carbon and alloy steels, tool steels, nitriding steels, corrosion-resistant steels, and other ferrous alloys using a process controlled automatically by the nitriding potential. Specifically, the nitriding process described herein is recommended for those applications where white layers are not permitted or are allowed to a limited thickness.

2. APPLICABLE DOCUMENTS

In addition to those listed in AMS2759, 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.

AMS2418	Plating, Copper
AMS2429	Plating, Bronze, Nitriding Stop-off, 90Cu - 10Sn
AMS2759	Heat Treatment of Steel Parts, General Requirements
AMS2759/9	Hydrogen Embrittlement Relief (Baking) of Steel Parts
AMS2759/11	Stress Relief of Steel Parts
AS7766	Terms Used in Aerospace Metals Specifications

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 E18	Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E140	Standard Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
ASTM E384	Standard Test Method for Microindentation Hardness of Materials

2.3 Definitions

Terms used in AMS2759/10 are defined in AMS2759, AS7766, and as follows:

2.3.1 COMPOUND ZONE LAYER (WHITE LAYER)

The surface of the steel may be converted to one or more compounds of essentially pure nitrides of metal, primarily iron. The layer formed, usually less than 0.001 inch (0.025 mm) in thickness, remains unetched when a metallographic sample is etched with Nital etchant and appears white in the microscope. For this reason, the layer is also called white layer.

2.3.2 CORE HARDNESS

The hardness used in determination of case depth. The hardness below the nitride case, as determined by a Knoop or a Vickers hardness traverse, where the average measured hardness does not change. A minimum of three hardness readings taken at a minimum distance of two times the case depth usually corresponds to this hardness.

2.3.3 PART HARDNESS

The overall hardness of the part as determined by the heat treatment used prior to any surface hardening and/or after surface hardening on a non-treated surface.

2.3.4 CASE HARDNESS

Case hardness and surface hardness are synonymous terms as they relate to determining the hardness of the nitrided area of the part.

2.3.5 PROCESS STAGE

A stage is a part of a process cycle, defined by temperature, time, atmosphere composition, and nitriding potential. It shall differ from other stages by at least one of these parameters, except time, to be recognized as a stage.

2.3.6 NITRIDING POTENTIAL

The nitriding potential is a measure of the nitriding capability of the nitriding atmosphere, which determines the surface nitrogen concentration in steel at a given temperature, and is described by Equation 1:

$$K_n = P_{NH_3} / \sqrt{P_{H_2}}^{3/2} \quad (\text{Eq. 1})$$

where:

P_{NH_3} = partial pressure of ammonia in the outgoing atmosphere

P_{H_2} = partial pressure of hydrogen in the outgoing atmosphere, the hydrogen being a product of dissociated ammonia

2.3.7 CORRELATION WITH NITROGEN CONCENTRATION

The correlation between the nitriding potential and nitrogen concentration in pure iron is shown in Figure 1.

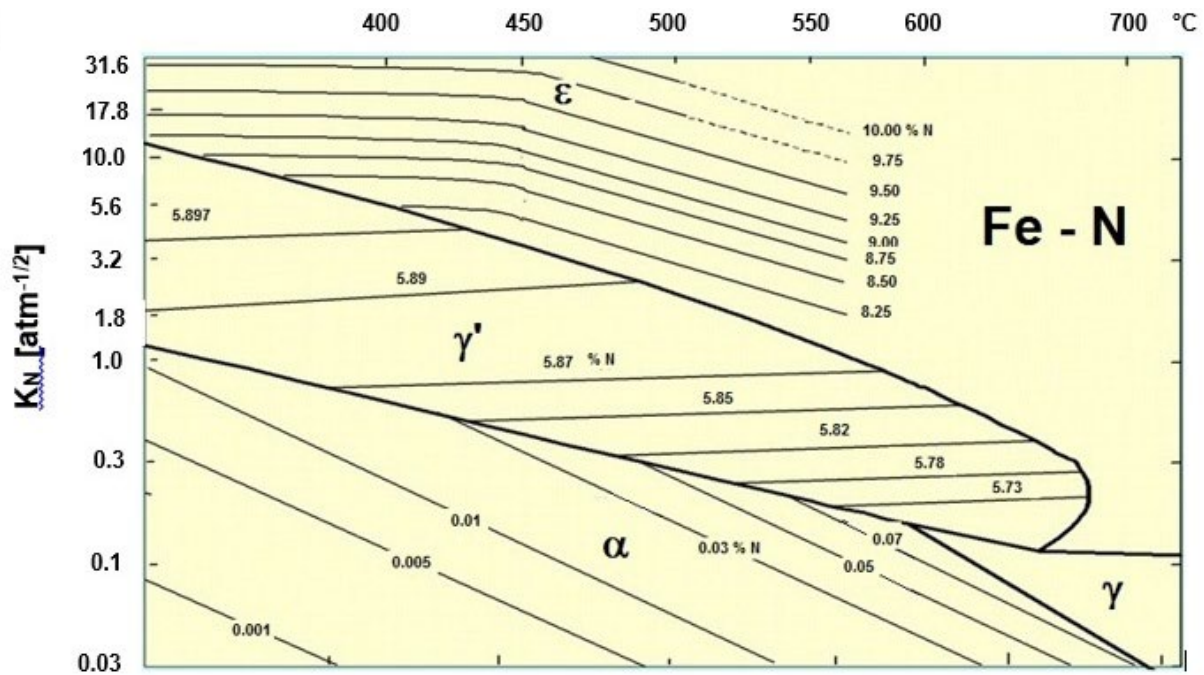


Figure 1 - The Lehrer diagram with adsorption isotherms for iron

3. TECHNICAL REQUIREMENTS

Shall be in accordance with AMS2759 and as follows:

3.1 Classification

The nitriding processes described herein are classified by the result they produce, as follows:

Class 0: No compound zone (white layer) permitted.

Class 1: 0.0005-inch (0.013-mm) maximum compound zone (white layer) thickness permitted.

Class 2: 0.001-inch (0.025-mm) maximum compound zone (white layer) thickness permitted.

If no class is specified, Class 2 applies.

3.2 Furnace Equipment

Shall be in accordance with AMS2759. Nitriding furnaces shall be Class 3 or better.

3.2.1 Shutdowns and Alarms

The furnace system shall be capable of automatically and safely shutting down the process in the event of a malfunction of the equipment such as power failure, interruption of gas flow, or any parameters exceeding their tolerance limits.

3.2.2 Atmosphere Control

Equipment shall be capable of introducing ammonia and dilution gases into the furnace at a controlled rate.

3.2.3 Auxiliary Equipment

Shall be in accordance with AMS2759.