AEROSPACE MATERIAL SPECIFICATION

AMS2485™	REV. M

Issued 1948-05
Reaffirmed 2021-08
Revised 2024-09

Superseding AMS2485L

Coating, Black Oxide

RATIONALE

AMS2485M results from a Five-Year Review and update of this specification with changes to Procedure (see 3.2.1), Oxalic Acid Spot Test (see 3.3.3), Sample Configuration (see 4.3.3), and Notes (see 8.3).

NOTICE

ORDERING INFORMATION: The following information shall be provided to the plating processor by the purchaser.

The purchase order shall specify not less than the following:

- AMS2485M
- Basis metal to be treated
- Tensile strength or hardness of the basis metal
- Pretreatment stress relief to be performed by the processor (time and temperature) if different from 3.1.2
- Special features, geometry, or processing present on parts that require special attention by the processor
- Optional: periodic testing frequency (see 4.2.2) and sample quantity (see 4.3.2)
- Quantity of pieces to be coated

1. SCOPE

1.1 Purpose

This specification covers the requirements for black oxide coatings on parts.

1.2 Application

This coating has been used typically to improve the anti-chafing and anti-friction properties of carbon and low-alloy steel parts, particularly for sliding or bearing surfaces, by providing a finish coating that retains an oil film, but usage is not limited to such applications.

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
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS2485M/

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 that may be involved in such use. It is the sole 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.

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.

ARP4992 Periodic Test for Processing Solutions

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 G46 Examination and Evaluation of Pitting Corrosion

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Preparation

3.1.1 The coating shall be applied to part surfaces free from water-breaks. The cleaning procedure shall not produce pitting or intergranular attack of the basis metal and shall preserve dimensional requirements.

3.1.2 Steel parts having a hardness of 36 HRC and higher and that are machined, ground, cold worked, or straightened shall be cleaned to remove surface contamination and thermally stress relieved before coating. Temperatures to which parts are heated shall be such that maximum stress relief is obtained while still maintaining hardness of parts within drawing limits. Unless otherwise specified, the following treatment temperatures and times shall be used:

3.1.2.1 For parts, excluding nitrided parts, having a hardness of 55 HRC and above, including carburized and induction hardened parts, stress relieve at 275 °F ± 25 °F (135 °C ± 14 °C) for a minimum of 4 hours.

3.1.2.2 For parts having a hardness less than 55 HRC, stress relieve at 375 °F ± 25 °F (191 °C ± 14 °C) for a minimum of 4 hours. Nitrided parts fall into this category. Higher temperatures shall be used only when specified or approved by the cognizant engineering organization.

3.2 Procedure

3.2.1 The cleaned parts, while still wet, shall be immersed in one or more aqueous alkali oxidizing baths for times and at temperatures recommended by the chemistry manufacturer, that will produce coatings meeting the requirements of 3.3 and 3.4 (see 8.3).

3.2.2 Coated parts shall be washed thoroughly in running water to remove all traces of processing solution and salts. Parts shall not be allowed to dry during the entire sequence of operations until completion of this rinse.

3.2.3 Parts shall be thoroughly dried unless a water-displacing oil is used in 3.2.4, in which case complete drying may be omitted.

3.2.4 Parts shall be dipped in a suitable corrosion-preventative oil.

3.3 Properties

Coated parts shall conform to the following requirements:

3.3.1 Smut Test

Coatings on parts before oiling as in 3.2.4, or on oiled parts after degreasing, shall show no indications of reddish-brown or green smut when wiped with a clean, white cloth.

3.3.2 Dimensional Change

When determined using a micrometer accurate to 0.0001 inch (0.0025 mm), no dimensional change shall result from processing.

3.3.3 Oxalic Acid Spot Test

The coating, prior to application of corrosion-preventative oil, shall be tested as follows. Clean, dry coated parts or specimens of the same material type and heat-treat condition as the parts and processed with the parts represented shall be handled with clean gloves. Each sample shall have deposited three drops of a 5% (approximately) solution of oxalic acid on a flat surface. Permit the accompanying reaction to continue for not less than 8 minutes, followed by rinsing in cool water and drying. When examined, the area that was directly under the acid test solution drops shall exhibit a black or dark brown center with a light border. Areas under the drop, which exhibit a gray center and lighter border, are marginal coatings and are not acceptable.

3.3.4 Surface and Intergranular Attack

The cleaning and coating process shall not result in any surface pitting, as determined by ASTM G46, and intergranular attack, determined on metallographically prepared cross sections examined unetched at 400X to 500X magnification.

3.4 Quality

Except as otherwise specified herein, the coating on polished surfaces shall be a uniformly lustrous black. Coating on other surfaces shall be black or dark gray in color and uniform on areas of equivalent surface roughness. Coating on all types of surfaces shall be free of spots of red oxide or an overall reddish-brown color, but an overall reddish-brown cast on a basically black color is permissible. Coating shall be continuous, smooth, dense, and adherent and shall not rub off under any conditions incident to normal handling or storage.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The processor of coated parts shall supply all samples for the processor's tests and shall be responsible for the performance of all required tests. Parts, if required for tests, shall be supplied by the purchaser. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Smut test (see 3.3.1), oxalic acid spot test (see 3.3.3), and quality (see 3.4) are acceptance tests and shall be performed on parts, or specimens representing parts when permitted by the cognizant engineering organization, from each lot.

4.2.2 Periodic Tests

Surface and intergranular attack (see 3.3.4) when parts 36 HRC or higher are processed are periodic tests and shall be performed monthly unless frequency of testing is specified by the purchaser. Tests of cleaning and coating baths are periodic tests and shall be performed at a frequency established by the processor unless frequency of testing is specified by the purchaser (see 4.4.3 and 8.2).

4.2.2.1 Periodic testing may be suspended in any test period (e.g., month or quarter) when parts are not processed.

4.2.3 Preproduction Tests

All property verification tests (see 3.3) are preproduction tests and shall be performed prior to production or on the initial shipment of coated parts to a purchaser and when the cognizant engineering organization requires confirmatory testing.

4.3 Sampling and testing shall be not less than the following; a lot shall be all parts made of the same material, heat treated to the same hardness or tensile strength, processed in the same solution(s) for not longer than 8 consecutive hours, and presented for the processor's inspection at one time. Parts for tests shall be selected randomly from all parts in the lot.

4.3.1 Acceptance tests shall be as shown in Table 1.

Table 1 - Sampling for acceptance tests

Lot Size	Quality	Smut Test	Oxalic Acid Spot Test
Up to 7	All	All or 3[(1)]	1
7 to 15	7	4	1
16 to 40	10	4	1
41 to 110	15	5	2
111 to 300	25	6	3
301 to 500	35	7	4
Over 500	50	8	5

(1) Whichever is less.

4.3.2 Periodic Tests

Sample quantity shall be selected at the discretion of the processor unless otherwise specified by the purchaser. As a minimum, one sample shall be tested for all periodic tests.