



AEROSPACE INFORMATION REPORT

AIR4789™

REV. B

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Reaffirmed 2021-06

Superseding AIR4789A

(R) Aerospace Information Report on Evaluating
Corrosion Testing of Electrical Connectors and
Accessories for the Purpose of Qualification

RATIONALE

AIR4789B has been reaffirmed to comply with the SAE five-year review policy.

FOREWORD

Military electrical connectors and their associated accessories traditionally utilize aluminum alloy as the standard material for component parts such as shells and coupling nuts. This SAE Aerospace Information Report (AIR) provides information on evaluating the effects of corrosion testing aluminum alloy parts coated with cadmium and nickel plating.

INTRODUCTION

This document provides information and guidelines on electrical connectors and accessories with components manufactured from aluminum alloy and plated with conductive coating materials.

Electrical connectors having their shell components manufactured from aluminum alloy offer the user a reliable light weight part that is inherently electrically conductive. Aluminum alloy is a soft substrate alloy susceptible to wear. To improve the surface durability, the aluminum alloy is coated with lubricious conductive coatings, like cadmium or nickel to improve the surface wear and provide means of coloration free of oxides. Aluminum alloy provides excellent electrical conductivity and good thermal conductivity inherently, however aluminum is nonmagnetic. Nickel plating provides aluminum alloy a low permeable coating that reduces magnetic field intrusion and is electrically conductive. A combination of cadmium and nickel plating has become a standard finish for military connectors manufactured from aluminum alloy.

Corrosion occurs to aluminum alloy parts plated with cadmium or cadmium and nickel or nickel plating when subjected to environments that provide an electrolyte to the galvanically dissimilar metals, when a hole or a pore provides a path through the plating to the aluminum substrate. Catastrophic erosion can occur to the aluminum part due to the aluminum sacrificing to the more noble plating materials.

Corrosion testing has been evaluated by subjectively determining if corrosion sites occur after salt fog testing described in EIA 364. Corrosion sites are acceptable if they do not effect performance. This document provides a method to objectively determine the effect to performance by definition of corrosion site size, quantity, and location to critical part elements.

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Documents

Document Sharing Hub

1. SCOPE:

1.1 Scope:

This SAE Aerospace Information Report (AIR) establishes guidelines for evaluating the effects of corrosion testing and acceptance criteria of aluminum alloy connectors and accessories with plating.

1.2 Corrosion Classification:

Aluminum connectors and accessories covered by this document shall be of the following types and classes:

Conductive with electrical path surfaces (see 5.1.6)

Conductive with nonelectrical path bodies (see 5.1.6.1)

Classification as described in 5.1.2

1.3 Field of Application:

Aluminum connectors and accessories are intended for general use, where durability and electrical ground paths are desired.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of 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.

2.1 SAE Publications:

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

AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
AMS-C-26074	Coatings, Electroless Nickel Requirement for

AS85049	Connector Accessories, Electrical, General Specification For
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2.2 ASTM Publications:

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

ASTM B 26/B 26M	Aluminum Alloy Sand Castings
ASTM B 85-76	Standard Specification for Aluminum Alloy Die Castings
ASTM B 209, 211, 221	Aluminum and Aluminum Alloy Bar, Rod, Wire or Special Shapes; Rolled Drawn, or Cold Finished; General Specification for
ASTM A 342	Indicator, Permeability, Low-Mu (Go-No-Go)
ASTM E 595-84	Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment, Test for
ASTM B 733-90	Standard Specification for Autocatalytic Nickel-Phosphorus Coating on Metals

2.3 U.S. Government Publications:

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

MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-1344	Test Methods for Electrical Connectors

2.4 NASA Publications:

NASA Publication 1124 Outgassing Data for Selecting Materials

2.5 Electronic Industries Association:

Available from EIA, 2500 Wilson Blvd., Arlington, VA 22201-3834.

EIA 364	Connector Test Method Standards
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3. REQUIREMENTS:

- 3.1 Critical Areas: Critical areas are design elements common in connector and accessory components, where corrosion sites would cause severe degradation to the performance of the part.

Critical areas: Threads, interlocking teeth, EMI shield termination areas, surfaces that provide a seal, surfaces that provide electrical bonding, and surfaces where corrosion by-products cause mating interference.

- 3.1.1 Noncritical Areas: Noncritical areas are design elements where corrosion sites would have minimal effect to the performance of the part.

Noncritical areas are defined as those areas not deemed critical in 3.1.