



AEROSPACE INFORMATION REPORT

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Superseding AIR4567B

Composite Electrical Connectors

RATIONALE

AIR4567C is being stabilized because the information and guidelines are considered mature and the committee does not anticipate future changes. Stabilization does not imply the information and guidance are unacceptable for applications for which it is designed. Any changes noted by a user which results in an information or guidance change will be addressed by a new revision.

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FOREWORD

This SAE Aerospace Information Report (AIR) provides information and guidelines on cylindrical and rectangular connectors and accessories with components manufactured from composite materials.

Electrical connectors and their associated accessories traditionally utilized aluminum alloy as the standard material for component parts such as shells and coupling nuts. This document provides information on connectors and accessories that utilize composite materials to replace the standard aluminum alloy components.

Composite connectors offer the user advantages over connectors constructed with aluminum components such as weight savings and corrosion protection.

This document addresses factors that military connector specifications, configured for aluminum components, may not clearly define and establishes guidelines for test requirements for specific applications.

General use connectors are designed to operate in severe environments typically associated with military defense electronics and weapon systems and commercial aerospace applications. Qualification test requirements from these environments have evolved and are defined in EIA 364. These assure the user that qualified connectors will meet those demanding performance parameters. Evaluating connectors containing composite components using testing evolved from experience with aluminum components may not identify stress factors associated with composite materials. The testing designed to find flaws in aluminum components may also inadvertently over stress composite materials.

Composite connectors offer the designer an alternative material to connectors having their shell components manufactured entirely from aluminum alloy for applications where weight saving and corrosion protection are desired. Composite connectors are intended to replace aluminum connectors and be capable of meeting their established performance parameters. See Section 4.

Composite connectors discussed in this document are connectors with shell components wholly or partly manufactured from high temperature resins in lieu of aluminum alloys. The composite material is generally defined as thermoplastic or thermoset resin mixed with a blend of strengthening fibers to achieve mechanical strength which is then metalized to achieve electrical performance similar to plated aluminum alloy. The composite connector or accessory shell may include a metal insert. The composite materials selected should be comparable to aluminum within the temperature realms specified in general use applications, such as -55 to +150 °C, -65 to +175 °C, -65 to +200 °C, and -65 to +260 °C. The design and construction of composite connectors is subject to the requirements of the connector specification. This document recommends designs that utilize high temperature thermoplastic or thermoset resins, compatible to metalization processes.

The effects of the following types of stress are known when applied to plated aluminum shell connectors, additional testing should be considered for composite connectors:

- a. Exposure to ultraviolet light
- b. Weatherability
- c. Flammability
- d. Resistance to hydrolysis
- e. Hygroscopicity
- f. Outgassing properties in a vacuum environment
- g. Fluid resistance
- h. Resistance to atomic oxygen
- i. Exposure to ozone
- j. Vacuum stability
- k. Shell electrical conductivity
- l. Resistance to EMI/RFI/EMP
- m. Resistance to indirect lightning strike
- n. Toxicity and odor in a high temperature vacuum environment
- o. Thread and bending strength at operating temperature

The purpose of this document is to provide information and guidelines that may not be clearly defined in the connector specifications and define terms and technologies associated with composite materials as they relate to electrical connectors and accessories.

1. SCOPE

1.1 Scope

This SAE Aerospace Information Report (AIR) establishes guidelines for evaluating composite electrical connectors and accessories.

1.2 Product Classification

Composite connectors and accessories covered by this document shall be of the following types, grades, and classes.

1.2.1 Types

- a. Type I: Circular
- b. Type II: Rectangular

1.2.2 Grades

- a. Grade A: Molded, Conductive
- b. Grade B: Molded, Nonconductive
- c. Grade C: Molded, Conductive, Encapsulated Metal Insert
- d. Grade D: Molded, Nonconductive, Encapsulated Metal Insert

1.2.3 Classes

- a. Class 1: General duty, -55 to +150 °C
- b. Class 2: General duty, -65 to +175 °C
- c. Class 3: General duty, -65 to +200 °C
- d. Class 4: High temperature, -65 to +260 °C
- e. Class 5: Space grade, -65 to +200 °C

1.3 Field of Application

Composite connectors and accessories are intended for general use, where weight reduction and improved corrosion protection are desired.

2. REFERENCES

2.1 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.

2.1.1 SAE Publications

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AIR1557	High and Extended Vibration Environment
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AS85049	Connector Accessories, Electrical, General Specification for
AS29600	Connectors, Electrical, Circular, Miniature, Composite, High Density, Quick Coupling, Environment Resistant, Removable Crimp Contacts, Associated Hardware, General Specification for