SAE Aerospace
An SAE International Group

AEROSPACE RECOMMENDED PRACTICE

SAE ARP1481 REV. A

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Supersedes ARP1481

Corrosion Control and Electrical Conductivity in Enclosure Design

1. SCOPE:

Corrosion control is always of concern to the designer of electronic enclosures. The use of EMI gaskets to provide shielding often creates requirements that are in conflict with ideal corrosion control. This SAE Aerospace Recommended Practice (ARP) presents a compatibility table (see Figure 1) which has as its objective a listing of metallic couples that are compatible from a corrosion aspect and which still maintain a low contact impedance.

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 U.S. Government Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-M-3171	Magnesium Alloy, Processes for Corosion Protection
MIL-C-5541B	Chemical Conversion Coatings on Aluminum and Aluminum Alloys - June 30, 1970
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys - June 30, 1970
MIL-STD-889	Dissimilar Metals

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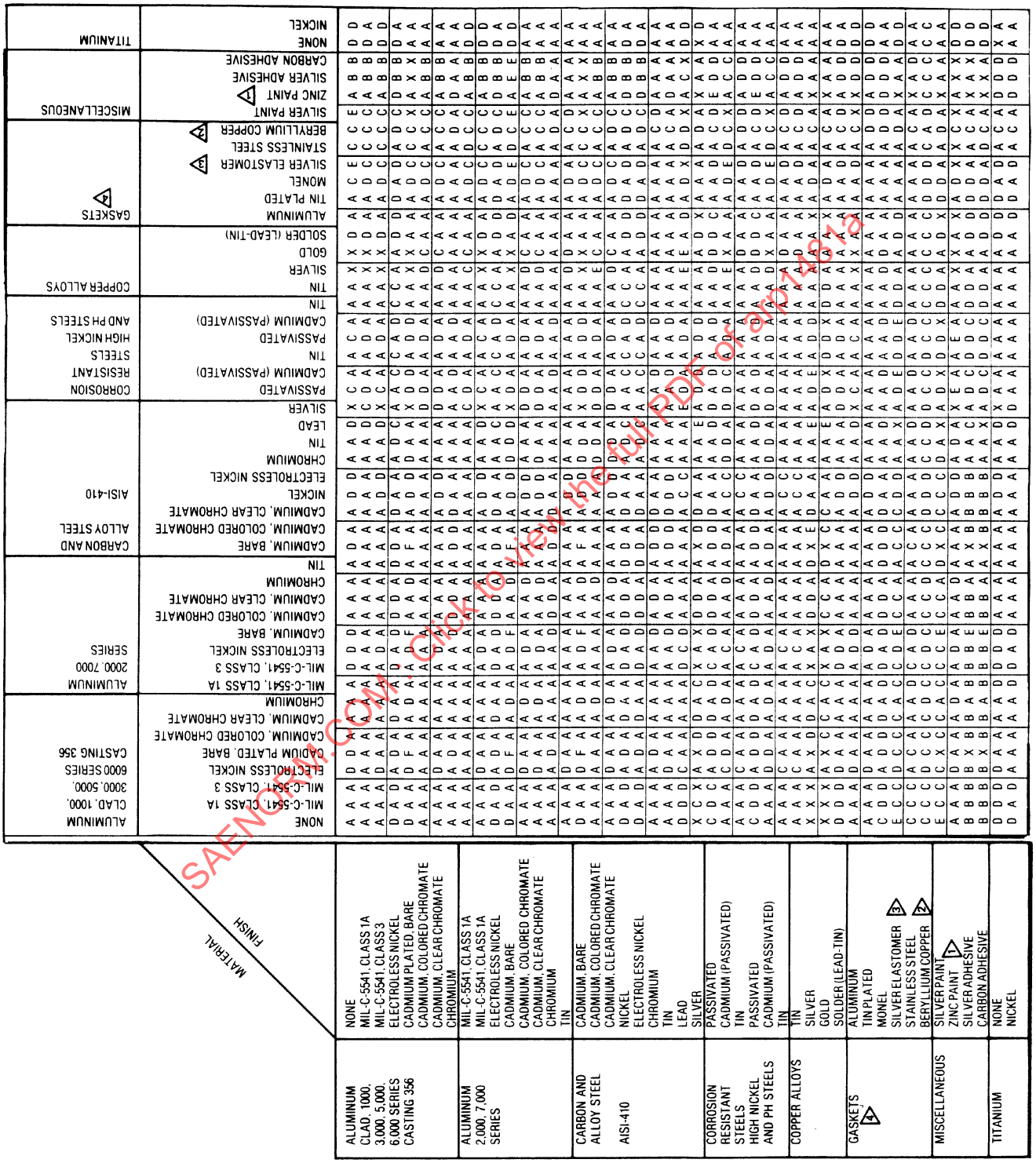

FIGURE 1

LEGEND/NOTES

A - COMPATIBLE

B - REQUIRES SEALING ONLY IF EXPOSED TO SALT ATMOSPHERE OR HIGH HUMIDITY. EDGE PRIMING MAY BE SATISFACTORY

C - REQUIRES SEALING IF EXPOSED TO HUMID ENVIRONMENT

D - COMPATIBLE IN ENVIRONMENT OF CONTROLLED TEMPERATURE AND HUMIDITY ONLY

E - REQUIRES SEALING REGARDLESS OF EXPOSURE

F - BECAUSE OF THE INHERENT CORRODABILITY OF THE MATERIAL, THE COUPLE SHOULD NOT BE USED OR MUST BE SEALED.

X - NOT USABLE

(1) REQUIRES 25.8 CM^2 AT 1.4 KG/CM^2(4 IN^2 AT 200PSI)

(2) NORMALLY PLATED WITH CADMIUM OR TIN

(3) BASED ON OPEN FLANGE DESIGN, IF MATERIAL IS IN A CAPTIVE (SELF-SEALING) CONFIGURATION, THE CATEGORY MOVES UP AS MUCH AS TWO STEPS

(4) THE GASKET MATERIALS MAY TAKE VARIOUS MANUFACTURED SHAPES AND CONFIGURATIONS, BUT ARE LISTED HERE BASED ONLY ON THEIR MATERIAL CONTENT.

FIGURE 1 (Continued)

2.2 Definitions:

2.2.1 MIL-C-5541 CLASS 1A AND 3 - CHROMATE CONVERSION COATINGS: The military specification controls the engineering requirements of these coatings. Class 1A is intended as a base for painting, while Class 3 is a controlled surface resistivity. Chemical materials for applying the coatings are contained in the qualified parts list (QPL) of MIL-C-81706.

2.2.2 CORROSION FREE COUPLE: A corrosion free couple is one that will maintain an impedance less than 2.5 $m\Omega^2$ at 1.4 kg/cm^2 (200 psi).

2.2.3 TABLE SYMBOLS: The following is a more complete definition of the symbols used in the table:

a. The couple is completely compatible and will function without further care.
b. Couple should be sealed only if exposed to salt environment.
c. If the couple is exposed for over 10% of its life-time to atmospheres above 85% relative humidity (RH), the exposed edges of the couple should be sealed with sealing compound or primers. If expsoures are less than 10% of the life at 85% RH, the couple may be considered as category B.
d. The couple is compatible and will function without further care if the use environment is generally below 85% relative humidity (RH) and use temperature below 160 °F (71 °C). If exposure exceeds these limits, the couple should be sealed.
e. Couple is sufficiently corrodible to require sealing at all times.
f. Material is inherently corrodible and the corrosion product will cause loss of couple conductivity.

2.2.4 EXPLANATIONS:

2.2.4.1 Increase in Corrosion: This table is about dissimilar materials. Some materials, by themselves, will corrode in a given environment. If corrosion will not increase because of the presence of the other element, it is listed as acceptable in this table.

2.2.4.2 Material Recommendations: It should be mentioned that the table in no way endorses the use of a specific material or finish in shielding design beyond that which the inherent physical properties of the materials themselves merit.

2.2.4.3 Use of Magnesium: It is recognized that magnesium is used in a number of applications. It is so corrodible that the only finish that has been found to be satisfactory is a minimum of 1 mil tin plate or reflow tin. In completely controlled environments, MIL-M-3171 Type 3 chemical coatings may be used. However, the initial resistance will be higher than tin and may increase with time.