

# Galvanic (Electrolytic) Corrosion and EMI Gaskets

Galvanic corrosion can occur whenever two or more dissimilar metals are in contact with each other whilst exposed to an electrically conductive liquid (such as sea water or rain water). The electrochemical action which takes place during galvanic corrosion is identical to that occurring in a battery, and a measurable voltage is produced. The most reactive of the metals becomes corroded, in preference to the less reactive metal, which remains unaffected. The greater the difference in the reactivity (position in the galvanic series) the greater the corrosion effect. This result is utilised in the protection of Steel, by galvanising (Zinc plating); the Zinc is corroded, but the Steel remains free from rust. Galvanic corrosion occurring in a gasket/enclosure assembly would increase the electrical resistance of the system, due to the formation of an oxide layer at the interface with the more reactive metal and thus diminish the effectiveness of the EMI gasket.

The table below, giving classifications of 'good', 'acceptable' and 'unsatisfactory', for compatibility of metals, is for guidance only and is intended to indicate preferred combinations of materials, in order to minimise the effect of galvanic corrosion. The table indicates suitability of materials in external, potentially hostile environments, including marine applications.

In a dry, indoor, office type environment, most combinations of gasket/enclosure material should be suitable, provided that they are not subject to condensation, dampness, or conditions of high humidity.

The choice of gasket for an enclosure made from, for example, Aluminium, is likely to be a compromise of desirable properties. It should also be noted that it may be possible to use an 'unsatisfactory' combination of metals for gasket/enclosure applications in an hostile environment, provided that the interface is protected by an efficient environmental seal. For reasons of long term stability and consistency of quality, the majority of EMI gaskets are made from less reactive materials.

As the actual conditions of use are beyond the control of the gasket supplier, users should always carry out testing, to ascertain for themselves, the best combination of gasket/enclosure material for their specific application. It is important not to be misled into assuming that because a gasket material is perfectly galvanically matched with the enclosure material, that corrosion will not occur. Reactive metals, such as Aluminium alloys, will readily corrode under certain conditions, however, various surface treatments exist which help to minimise or delay the effect of galvanic corrosion.

## Environment: Outdoor, including Marine

Gasket Material / Enclosure Material	Aluminium	T.C.S.	Stainless Steel	Monel	Silver plated Aluminium Elastomer	Nickel Loaded Elastomer	Silver Plated Nickel loaded in Elastomer	Silver Plated Copper loaded in Elastomer	Silver Plated Glass loaded in Elastomer	Silver Particles loaded in Elastomer	Beryllium Copper
Magnesium & Magnesium Alloys	G	U	U	U	A	A	U	U	U	U	U
Zinc and Galvanised Steel	G	U	U	U	A	A	U	U	U	U	U
Aluminium Alloys	G	U	U	U	A	A	U	U	U	U	U
Cadmium and Cadmium Plating	A	U	A	U	A	A	U	U	U	U	U
Tin and Tin Plating	A	U	A	A	A	G	A	U	A	A	A
Nickel and Nickel Plating	A	U	G	G	A	G	G	A	G	G	G
Chromium and Chromium Plating	A	U	G	G	G	G	G	G	G	G	G
Copper, Brasses and Bronzes	U	U	G	G	G	G	G	G	G	G	G
Stainless Steel (300 Series)	U	U	G	G	G	G	G	G	G	G	G
Titanium	U	U	G	G	G	G	G	G	G	G	G
Silver and Silver Plating	U	U	G	G	G	G	G	G	G	G	G
Gold and Gold Plating	U	U	G	G	G	G	G	G	G	G	G

Key: G = Good A = Acceptable U = Unsatisfactory