

Bi-Metallic Corrosion Advice

Bi-metallic Corrosion (or Galvanic Corrosion) is the process by which metals, when in contact with each other, oxidize or corrode. In order for Bi-metallic Corrosion to occur there are three conditions that must exist or the process of corrosion will not begin under any circumstance.

1. There must be two electrochemically dissimilar metals present but not necessarily in contact with each other.
2. There must be an electrically conductive path between the two metals.
3. There must be an electrolyte to allow the metal ions to conduct along the provided path from the more anodic metal to the more cathodic metal.

If any one of these three conditions does not exist, bi-metallic corrosion will not occur.

There are a number of variables that contribute towards bi-metallic corrosion such as the base metals, the type of electrolyte (commonly this is seawater) and the type of environment the installation is in. As such it is not practical to illustrate all of the potential situations that can occur that can ultimately lead to corrosion problems. As a result the following data should only be used for guidance purposes. If a more definitive solution is required then Peppers recommends that tests be conducted involving the materials required, the appropriate electrolyte and the specific environment.

As a general rule the less noble metal corrodes leaving the more noble metal intact, for example, if aluminium and 316 stainless steel are in contact in the presence of a suitable electrolyte such as seawater a current will flow between the metals resulting in severe corrosion of the aluminium. However, it should be remembered that some metals are protected from corrosion by natural oxides or passive films and unless these are broken down they will behave as if they are more noble than their electro-potential would suggest. Furthermore plating or painting of the enclosure / equipment, the geometry and the relative surface areas of the metals in contact can have a significant effect on the overall corrosion reaction.

		Enclosure / Equipment Material														
		316 Stainless Steel			Mild Steel			Aluminium			Brass			Polyamide		
Environment		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cable Gland Material	Brass	A	B	C	B	C	D	B	D	D	A	A	A	A	A	A
	Nickel Plated Brass	A	B	C	B	C	D	B	D	D	A	A	A	A	A	A
	316 Stainless Steel	A	A	A	A	C	D	A	C	D	A	B	C	A	A	A
	Aluminium	A	C	D	B	C	D	A	A	A	B	D	D	A	A	A
	Polyamide	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Notes: The polyamide materials detailed above have been included for reference purposes only as they do not exhibit bi-metallic corrosion. The above information does not give advice on how individual materials will corrode when submerged in seawater.

Key:

Environment

1. Equipment housed indoor and protected from the outside environment
2. Equipment housed outside in a marine environment
3. Equipment submerged in seawater

Corrosion Effect

- A. Very slight or no corrosion may occur between the cable gland and the enclosure / equipment
- B. Slight corrosion may occur between the cable gland and the enclosure / equipment
- C. Fairly severe corrosion may occur between the cable gland and the enclosure / equipment
- D. Severe corrosion will occur between the cable gland and the enclosure / equipment

Disclaimer

Peppers Cable Glands Ltd has provided this information based upon our knowledge and experience of cable gland installation and practical situations that we have encountered. Peppers Cable Glands Ltd are not experts in the field of corrosion prevention and can take no responsibility for any damage, injury or other consequential loss from the opinions expressed in this document. The information provided within this document is for information purposes only and the advice of a corrosion expert should be sought if any doubt remains about the integrity of an installation due to the potential of corrosion occurring. All cable glands and equipment used in hazardous areas should only be installed and used as described in the manufacturer's instructions and the appropriate code of practice. This datasheet is not intended to advise on the selection of cable glands.