01

Electrical jointing

- Corrosion of Connectors
- Electrical Jointing
- Joint Compounds
- EJC No. 2
- ALV300
- Scratch Brushes

Clinsman ELECTRICAL DISTRIBUTOR PTY LTD

Corrosion of Connectors

Two factors are associated with corrosion:

1. Atmospheric action
2. Galvanic action

For atmospheric action to result in corrosion, there must be moisture and oxygen.

Galvanic action results in corrosion when two dissimilar metals in the electrolytic series, for example, aluminium and copper, are in physical contact. In this case, moisture acts as an electrolyte.

In such an instance, the copper becomes a cathode and receives a positive charge; the aluminium becomes the anode and receives a negative charge.

The resultant current flow attacks the aluminium leaving the copper unharmed.

Both factors described above are influenced by environmental conditions - the chemical attack of airborne pollutants.

This occurs in rural areas to a lesser extent than in urban centres and more so in heavy industry locations such as steelworks, chemical plants, refineries, etc.

The problem of the mechanical jointing of two dissimilar metals in physical contact with each other, such as aluminium and copper, stems from their difference in electrical potential.

The column of metals listed here shows their relative positions in the Electrolytic Series, with the more anodic metals in the higher positions and the more cathodic in the lower.

The extent, or severity, of the corrosive action is proportional to the distance of separation of the metals in the list. i.e. the magnitude of the difference in electrolytic potential of the two metals, aluminium and copper, is quite considerable.

Aluminium to Aluminium Connections

No problem exists in the jointing of these conductors as electrolytic action is nonexistent. Nevertheless, care must be taken to prevent crevice corrosion and to select an aluminium alloy connector body not liable to stress corrosion cracking.

Aluminium to Copper Connections

The best choice is an aluminium bodied connector since it is not subject to the galvanic attack of the more vulnerable element - the aluminium conductor. It is good practice to use contact sealant on the aluminium connector body and brushed into the strands of the aluminium conductor. Wherever possible, install the aluminium conductor above the copper to prevent pitting from the galvanic action of copper salts washing over the aluminium connector and conductor when in a lower position.

Copper to Copper Connections

No problem exists in the jointing of these conductors as electrolytic action is nonexistent.

The Electrolytic Series

ANODIC (Corroded End)

Magnesium
Aluminium
Duralumin
Zinc
Cadmium
Iron
Chromium Iron (active)
Chromium-Nickel-Iron (active)
Soft solder
Tin
Lead
Nickel
Brasses
Bronze
Monel
Copper
Chromium Iron (passive)
Chromium-Nickel-Iron (passive)
Silver solder
Silver
Gold
Platinum

CATHODIC (Protected End)

Electrical Jointing of Aluminium

A particular phenomenon associated with the jointing of aluminium conductors, concerns the oxide film that forms rapidly on the surface of freshly cleaned aluminium exposed to air. This oxide film is an insulator and must be removed with a scratch brush in order to achieve a satisfactory and reliable electrical joint. The problem with aluminium is that the freshly cleaned surface will quickly re-oxidise, hence it is important to coat the surface with a contact sealant.

Contact Sealants

Various sealant formulations have been developed to provide improved electrical and mechanical performance as well as environmental protection to the contact area. The use of sealants is recommended for aluminium to aluminium or aluminium to copper connections. Sealants are also recommended for copper to copper joints which are subject to severe corrosive environments. Non-gritted sealants are recommended for flat connections and as a groove sealant in bolted connectors such as parallel groove clamps. Our gritted sealant is primarily used in compression connectors. The sharp metallic grit particles provide multi-contact current carrying bridges through remaining oxide films to ensure superior electrical conductivity.

Product Name	Description	Recommended Applications
EJC2	A mineral oil based corrosion inhibitor with added fluoride to dissolve aluminium oxide. Drop point 65.6^{o}C	**Palm to Palm Joints** - Alum to Alum - Alum to Copper
Alvania ALV300	A mineral oil based corrosion inhibitor with added lithium. Drop point 180^{o}C	**Bolted Connections** - Alum to Alum - Alum to Copper - Copper to Copper **Palm to Palm** - Copper to Copper
Alminox ALM325G	A mineral oil based corrosion inhibitor with added zinc grit. Drop point 188^{o}C. Provides excellent outdoor weathering protection.	**Compression Joints** **Bolted Connections** - Alum to Alum - Alum to Copper

Contact Sealants and Scratch Brushes

EJC2

Recommended for use with flat, aluminium surface to surface bolted joints, such as busbar joints & terminal lugs. EJC2 contains fluoride which, together with scratch brushing, assists in breaking up the oxide film by chemically etching the connecting surfaces to ensure a low resistance joint. Catalogue number **EJC2**, supplied in 225g squeeze tubes.

ALMINOX

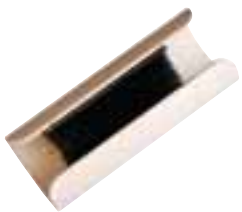
Recommended for aluminium to aluminium bolted or compression connections. Alminox contains sharp, conductive zinc granules suspended in a viscous petroleum base. Under pressure these granules make high pressure contact points with the parent metal to effect a sound electrical connection, whilst the base material seals the joint to prevent further corrosion. Catalogue number **ALM325G**, supplied in 325g squeeze tubes.

ALV300

Recommended for all bolted connections, such as parallel groove clamps, either aluminium to aluminium, or bi-metal copper to aluminium. When applied immediately after scratch brushing, ALV300 seals the exposed surface to prevent re-oxidation and permanently excludes the future ingress of air and moisture. ALV300 is extremely adhesive, resistant to water and has high temperature resistance to ensure continuous operation under all situations. Catalogue number **ALV300**, supplied in 225g squeeze tubes.

Scratch Brushes

The use of a suitable scratch brush to remove any existing oxide film, dirt or grease from the conductor is essential to ensure a sound electrical connection. Dulmison produces separate brushes for use on aluminium and copper conductors to prevent transference of metal particles.



White brush for use on aluminium.
Cat number: **SB3**

Black brush for use on copper.
Cat number: **SB4**