Subject: Aluminum Fastened with ZN or GRABBERGARD® Coated Screws

Below is copy of a galvanic chart ranking the dissimilar metals anodic to cathodic.

The farther apart they metals are from each other on this chart the more severe the galvanic activity, i.e. The contact of Magnesium and Platinum would result in the greatest galvanic action, the contact of tin and lead would result in little galvanic action.

The Cathodic attacks the Anodic. The greater the distance on the chart, the more current generated.

It should be noted that Galvanic action does not always translate into increased or accelerated corrosion, but that if sacrificial plating is incorporated in the fastener design, then galvanic action can accelerate the deterioration of the sacrificial coating. With the close proximity of the Aluminum, (Note that even different grades of Aluminum will generate galvanic action) to zinc we would anticipate mild galvanic activity. We would advise that the suggested fasteners for this type of application would incorporate our GRABBERGARD® coating which utilizes both barrier and sacrificial coatings to minimize the chance and/or rate of corrosion. The barrier coating used to encapsulate our zinc and anti corrosion chemical bonding agents minimize the opportunity for contact to occur between the iron substrate of the fastener and the materials being fastened.

The rate at which corrosion takes place is determined by:

- The distance separating the metals on the galvanic series chart
- The temperature and concentration of the electrolyte. The higher the temperature, the faster it happens. Any stray electrical currents in the electrolyte will increase the corrosion also.
- The relative size of the metal pieces. A large cross section piece will not be affected as much as a smaller one.
### GALVANIC REACTION CHART

**GO01. GALVANIC CHART**

**CORRODED END (ANODIC OR LEAST NOBLE)**
- MAGNESIUM
- MAGNESIUM ALLOYS
- ZINC
- ALUMINUM 5052, 3004, 3003, 1100, 6053
- CADMIUM
- ALUMINUM 2117, 2017, 2024
- MILD STEEL (1018), WROUGHT IRON
- CAST IRON, LOW ALLOY HIGH STRENGTH STEEL
- CHROME IRON (ACTIVE)
- STAINLESS STEEL, 430 SERIES (ACTIVE)
- 302, 303, 304, 321, 347, 410, 416, STAINLESS STEEL (ACTIVE)
- NI - RESIST
- 316, 317, STAINLESS STEEL (ACTIVE)
- CARPENTER 20 CB-3 STAINLESS (ACTIVE)
- ALUMINUM BRONZE (CA 687)
- HASTELLOY C (ACTIVE) INCONEL 625 (ACTIVE) TITANIUM (ACTIVE)
- LEAD - TIN SOLDERS
- LEAD
- TIN
- INCONEL 600 (ACTIVE)
- NICKEL (ACTIVE)
- 60 NI-15 CR (ACTIVE)
- 80 NI-20 CR (ACTIVE)
- HASTELLOY B (ACTIVE)
- BRASSES
- COPPER (CA102)
- MANGANESE BRONZE (CA 675), TIN BRONZE (CA903, 905)
- SILICON BRONZE
- NICKEL SILVER
- COPPER - NICKEL ALLOY 90-10
- COPPER - NICKEL ALLOY 80-20
- 430 STAINLESS STEEL
- NICKEL, ALUMINUM, BRONZE (CA 630, 632)
- MONEL 400, K500
- SILVER SOLDER
- NICKEL (PASSIVE)

**60 NI- 15 CR (PASSIVE)**
- INCONEL 600 (PASSIVE)
- 80 NI-20 CR (PASSIVE)
- CHROME IRON (PASSIVE)
- 302, 303, 304, 321, 347, STAINLESS STEEL (PASSIVE)
- 316, 317, STAINLESS STEEL (PASSIVE)
- CARPENTER 20 CB-3 STAINLESS (PASSIVE), INCOLOY 825
- NICKEL - MOLYBDENUM - CHROMIUM - IRON ALLOY (PASSIVE)
- SILVER
- TITANIUM (PASS.) HASTELLOY C & C276 (PASSIVE), INCONEL 625(PASS.)
- GRAPHITE
- ZIRCONIUM
- GOLD
- PLATINUM

**PROTECTED END (CATHODIC OR MOST NOBLE)**