



Corrosion of Base Metals in Contact

The susceptibility of different base metals to corrosion while in contact, depends upon the difference between the contact potentials, or the electromotive voltages of the metals involved. The greater the potential difference is, the greater is the tendency for corrosion. The metal with the higher potential forms the anode and is corroded. In other words, the larger the separation distance in the electromotive chart between the two metals in contact, the higher the contact potential and chances for corrosion. For example, zinc and aluminum are very short distance apart in the chart; therefore potential for corrosion when these two metals are in contact is very low. On the other hand, aluminum and passivated 316 stainless steel are far apart; hence, when in contact,

the potential for corrosion is very high. Aluminum, being more anodic metal, will corrode in this combination.

As a general guideline, if the metals are half the length of the chart or more apart, the combination should be avoided. Also, it is not a good idea to combine an anodic metal part with thin cross section, such as thin wall tubing, with a cathodic or less anodic metal part of a heavy cross section, such as a fitting.

Example: A thin wall brass tube with steel fitting is a better, although not ideal, combination than a thin wall steel tube with brass fitting.

Electromotive or Galvanic Series for Metals	
+ Anodic (least noble) corroded ↑ Electric current flows from plus to minus ↓ - Cathodic (most noble) protected	Magnesium Magnesium alloys Zinc (Parker steel fittings are zinc plated) Berillium Aluminum 5052, 3004, 3003, 1100, 6053 Cadmium Aluminum 2117, 2017, 2024 T4 Mild steel (1018), wrought iron, free machining steel (12L14) Low alloy high strength steel, cast iron Chrome iron (active) 430 Stainless (active) 302, 303, 321, 347, 410, 416, stainless steel (active) Ni-resist 316, 317 stainless steel (active) Carpenter 20Cb-3 stainless (active) Aluminum bronze (CA 687) Hastelloy C (active) Inconel 625 (active) Titanium (active) Lead/Tin solder Lead Tin Inconel 600 (active) Nickel (active) 60 Ni-15 Cr (active) 80 Ni-20 Cr (active) Hastelloy B (active) Naval brass (CA 464), Yellow brass (CA 268), Brass (CA360) Red brass (CA 230), Admiralty brass (CA 443) Copper (CA 102) Maganese bronze (CA 675), Tin bronze (CA 903, 905) 410, 416 Stainless (passive) Phospher bronze (CA 521, 524) Silicon bronze (CA 651, 655) Nickel silver (CA 732, 735, 745, 752, 754, 757, 764, 770, 794) Cupro Ni 90-10 Cupro Ni 80-20 430 Stainless steel (passive) Cupro Ni 70-30 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 stainless steel (passive) 316, 317 stainless steel (passive) (Parker stainless steel fittings are passivated) Carpenter 20 Cb-3 stainless (passive), Incoloy 825 Silver Titanium (passive), Hastelloy C & C276 (passive), Inconel 625 (passive) Graphic Zirconium Gold Platinum

Table U5 — Electromotive or Galvanic Series for Metals