DEMINERALISED WATER AND CORROSION

G.LION

Corrosion rate depends on the amount of current discharge from the corroding metal into the electrolyte, and the amount of current depends, among other things, on the electrolyte resistivity, or in simple terms, it follows Ohm's law I=E/R.
Thus the higher the electrolyte resistivity, the less the current flow, and the corrosion.

Galvanic corrosion in demineralized water

Corrosion is an electrochemical phenomenon that involve electrons exchange e.g.:

$Al = Al^{3+} + 3\ e^-$ Anodic reaction (Oxidation)

$2H^+ + 2\ e^- = H_2$ Cathodic reaction (Reduction)

Water is the carrier for current and its resistivity plays a fundamental role in the rate of corrosion.

Galvanic corrosion happens when two dissimilar metals are in contact in the presence of a **corrosive electrolyte.**
Any alloy will be preferentially corroded when coupled to a more “noble” or positive alloy in the Galvanic Series.

But these series is the result of extensive experimental studies in corroding electrolyte, like aerated sea water.

Completely different behaviour in Demineralized water

Galvanic couple Stainless Steel/Al

Stainless steel (Alloy of Fe, Ni and Cr):
Chromium is the key alloying element forming resistant passive oxide films on the surface.

Al: its surface is always covered with an extremely adherent and inert oxide film, Al_2O_3.

Looking at the Pourbaix diagram that shows the range of stability of species with respect to pH and potential we can see that the Oxides are the stable specie at pH 7

Conclusions

In demineralized water the galvanic corrosion phenomena between Al and SS are very limited.
If the water conductivity is always around 0.1 microSiemens and there are no unforeseen phenomena (e.g. cleanliness, pollution with Cu particles that can start localised pitting on Al, or bacterial proliferation that may change locally the water composition, or pH alteration) it is possible to say, qualitalively, that the simple surface to surface contact would not affect the corrosion behaviour of the couple.