



Standard Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance¹

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1. Scope

1.1 This guide covers the development of a galvanic series and its subsequent use as a method of predicting the effect that one metal can have upon another metal can when they are in electrical contact while immersed in an electrolyte. Suggestions for avoiding known pitfalls are included.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 5.

2. Referenced Documents

2.1 *ASTM Standards:*²

G3 Practice for Conventions Applicable to Electrochemical Measurements in Corrosion Testing

G15 Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)³

G16 Guide for Applying Statistics to Analysis of Corrosion Data

G71 Guide for Conducting and Evaluating Galvanic Corrosion Tests in Electrolytes

3. Terminology

3.1 Definitions of terms used in this guide are from Terminology **G15**.

¹ This guide is under the jurisdiction of ASTM Committee **G01** on Corrosion of Metals and is the direct responsibility of Subcommittee **G01.11** on Electrochemical Measurements in Corrosion Testing.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

3.2 *active*—the negative (decreasingly oxidizing) direction of electrode potential.

3.3 *corrosion potential*—the potential of a corroding surface in an electrolyte relative to a reference electrode measured under open-circuit conditions.

3.4 *galvanic corrosion*—accelerated corrosion of a metal because of an electrical contact with a more noble metal or nonmetallic conductor in a corrosive electrolyte.

3.5 *galvanic series*—a list of metals and alloys arranged according to their relative corrosion potentials in a given environment.

3.6 *noble*—the positive (increasingly oxidizing) direction of electrode potential.

3.7 *passive*—the state of the metal surface characterized by low corrosion rates in a potential region that is strongly oxidizing for the metal.

3.8 *polarization*—the change from the open-circuit electrode potential as the result of the passage of current.

4. Significance and Use

4.1 When two dissimilar metals in electrical contact are exposed to a common electrolyte, one of the metals can undergo increased corrosion while the other can show decreased corrosion. This type of accelerated corrosion is referred to as galvanic corrosion. Because galvanic corrosion can occur at a high rate, it is important that a means be available to alert the user of products or equipment that involve the use of dissimilar metal combinations in an electrolyte of the possible effects of galvanic corrosion.

4.2 One method that is used to predict the effects of galvanic corrosion is to develop a galvanic series by arranging a list of the materials of interest in order of observed corrosion potentials in the environment and conditions of interest. The metal that will suffer increased corrosion in a galvanic couple in that environment can then be predicted from the relative position of the two metals in the series.

4.3 Types of Galvanic Series:

4.3.1 One type of Galvanic Series lists the metals of interest in order of their corrosion potentials, starting with the most active (electronegative) and proceeding in order to the most