



Standard Guide for Evaluating Corrosion Properties of Wrought Iron- and Nickel-Based Corrosion Resistant Alloys for Chemical Process Industries¹

This standard is issued under the fixed designation G157; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers an evaluation approach that is designed to provide information on the corrosion properties of wrought iron- and nickel-based alloys for the chemical process industries. This guide incorporates test conditions for general corrosion measurements in a variety of environments, crevice corrosion resistance in chloride environments, and stress corrosion cracking resistance in chloride environments.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1193 Specification for Reagent Water

G1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

G15 Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)³

G30 Practice for Making and Using U-Bend Stress-Corrosion Test Specimens

G36 Practice for Evaluating Stress-Corrosion-Cracking Resistance of Metals and Alloys in a Boiling Magnesium Chloride Solution

G46 Guide for Examination and Evaluation of Pitting Corrosion

G48 Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution

G123 Test Method for Evaluating Stress-Corrosion Cracking of Stainless Alloys with Different Nickel Content in Boiling Acidified Sodium Chloride Solution

3. Terminology

3.1 Terms such as *crevice corrosion*, *stress corrosion cracking*, and *corrosion rate* are defined in Terminology **G15**.

4. Significance and Use

4.1 This guide is intended to provide a series of evaluations that will assist engineers dealing with chemical environments in selecting appropriate alloys (**1-3**). In chemical environments, an important issue for determining general corrosion resistance is the temperature at which an alloy transitions from corrosion at a low rate to corrosion at a much higher rate. Other important concerns include the tendency towards crevice corrosion and stress corrosion cracking resistance, especially in hot chloride-containing aqueous environments.

4.2 This guide is also intended for alloy developers to assist them in choosing environments and test methods that are of particular interest to the chemical process industries.

4.3 The use of this approach will allow direct comparisons to be made among alloys from various suppliers and, thereby, to assist engineers in selecting the most appropriate materials for further testing to determine suitability in their application.

5. General Corrosion Resistance

5.1 The general corrosion resistance of nickel- and iron-based alloys is determined in 14 test solutions at various temperatures to determine the lowest temperature at which the corrosion rate exceeds 0.13 mm/y (5 mpy). The test solutions are listed in **Table 1**. A suggested procedure is provided in **Appendix X1**. The test is run on three coupons of metal for each environment. The tests are run for two 48-h exposures with one specimen exposed for the total 96 h. Welded specimens may be used if results are required on weldments.

¹ This guide is under the jurisdiction of ASTM Committee **G01** on Corrosion of Metals and is the direct responsibility of Subcommittee **G01.05** on Laboratory Corrosion Tests.

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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.