



Standard Guide for Online Monitoring of Corrosion in Plant Equipment (Electrical and Electrochemical Methods)¹

This standard is issued under the fixed designation G96; 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 the procedure for conducting online corrosion monitoring of metals in plant equipment under operating conditions by the use of electrical or electrochemical methods. Within the limitations described, these test methods can be used to determine cumulative metal loss or instantaneous corrosion rate, intermittently or on a continuous basis, without removal of the monitoring probes from the plant.

1.2 The following test methods are included: Test Method A for electrical resistance, and Test Method B for polarization resistance.

1.2.1 Test Method A provides information on cumulative metal loss, and corrosion rate is inferred. This test method responds to the remaining metal thickness except as described in Section 5.

1.2.2 Test Method B is based on electrochemical measurements for determination of instantaneous corrosion rate but may require calibration with other techniques to obtain true corrosion rates. Its primary value is the rapid detection of changes in the corrosion rate that may be indicative of undesirable changes in the process environment.

1.3 The values stated in SI units are to be considered standard. The values in parentheses are for information only.

1.4 *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 5.6.

2. Referenced Documents

2.1 ASTM Standards:²

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

Current edition approved Aug. 1, 2013. Published August 2013. Originally approved in 1990. Last previous edition approved in 2008 as G96–90 (2008). DOI: 10.1520/G0096-90R13.

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.

D1125 Test Methods for Electrical Conductivity and Resistivity of Water

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

G3 Practice for Conventions Applicable to Electrochemical Measurements in Corrosion Testing

G4 Guide for Conducting Corrosion Tests in Field Applications

G15 Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)³

G59 Test Method for Conducting Potentiodynamic Polarization Resistance Measurements

G102 Practice for Calculation of Corrosion Rates and Related Information from Electrochemical Measurements

3. Terminology

3.1 *Definitions*—See Terminology G15 for definitions of terms used in this guide.

4. Summary of Guide

4.1 *Test Method A—Electrical Resistance*—The electrical resistance test method operates on the principle that the electrical resistance of a measuring element (wire, strip, or tube of metal) increases as its cross-sectional area decreases:

$$R = \sigma \frac{l}{A} \quad (1)$$

where:

R = resistance,

σ = resistivity of metal (temperature dependent),

l = length, and

A = cross-section area.

In practice, the resistance ratio between the measuring element exposed to corrosion and the resistance of a similar reference element protected from corrosion is measured, to compensate for resistivity changes due to temperature. Based on the initial cross-sectional area of the measurement element, the cumulative metal loss at the time of reading is determined. Metal loss measurements are taken periodically and manually

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