



Standard Guide for Corrosion Monitoring in Laboratories and Plants with Coupled Multielectrode Array Sensor Method¹

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1. Scope

1.1 This guide outlines the procedure for conducting corrosion monitoring in laboratories and plants by use of the coupled multielectrode array sensor (CMAS) technique.

1.2 For plant applications, this technique can be used to assess the instantaneous non-uniform corrosion rate, including localized corrosion rate, on a continuous basis, without removal of the monitoring probes, from the plant.

1.3 For laboratory applications, this technique can be used to study the effects of various testing conditions and inhibitors on non-uniform corrosion, including pitting corrosion and crevice corrosion.

1.4 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.5 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

- G1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens
- G4 Guide for Conducting Corrosion Tests in Field Applications
- G16 Guide for Applying Statistics to Analysis of Corrosion Data
- 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

- G96 Guide for Online Monitoring of Corrosion in Plant Equipment (Electrical and Electrochemical Methods)
- G102 Practice for Calculation of Corrosion Rates and Related Information from Electrochemical Measurements
- G193 Terminology and Acronyms Relating to Corrosion
- G199 Guide for Electrochemical Noise Measurement

3. Terminology

3.1 *Definitions*—The terminology used herein, if not specifically defined otherwise, shall be in accordance with Terminology G193. Definitions provided herein and not given in Terminology G193 are limited only to this guide.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *coupled multielectrode array sensor, CMAS, n*—device with multiple working electrodes that are coupled through an external circuit such that all the electrodes operate at the same electrode potential to simulate the electrochemical behavior of a single-piece metal.

3.2.2 *non-uniform corrosion, n*—corrosion that occurs at various rates across the metal surface, with some locations exhibiting higher anodic rates while others have higher cathodic rates, thereby requiring that the electron transfer occurs between these sites within the metal.

3.2.2.1 *Discussion*—Non-uniform corrosion includes both localized corrosion and uneven general corrosion (**1**).³ Non-uniform corrosion also includes the type of general corrosion that produces even surfaces at the end of a large time interval, but uneven surfaces during small time intervals.

3.2.3 *uneven general corrosion, n*—corrosion that occurs over the whole exposed surface or a large area at different rates.

3.2.3.1 *Discussion*—In this guide, general corrosion is further divided into even general corrosion, or uniform corrosion, which is defined as the corrosion that proceeds at exactly the same rate over the surface of a material (see Terminology G193) and uneven general corrosion. Uneven general corrosion is defined as the general corrosion that produces uneven

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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 boldface numbers in parentheses refer to a list of references at the end of this standard.