



# Standard Test Method for Electrochemical Reactivation (EPR) for Detecting Sensitization of AISI Type 304 and 304L Stainless Steels<sup>1</sup>

This standard is issued under the fixed designation G108; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers a laboratory procedure for conducting an electrochemical reactivation (EPR) test on AISI Type 304 and 304L (UNS No. S30400 and S30403, respectively) stainless steels. This test method can provide a nondestructive means of quantifying the degree of sensitization in these steels (**1**, **2**, **3**).<sup>2</sup> This test method has found wide acceptance in studies of the effects of sensitization on intergranular corrosion and intergranular stress corrosion cracking behavior (see Terminology **G15**). The EPR technique has been successfully used to evaluate other stainless steels and nickel base alloys (**4**), but the test conditions and evaluation criteria used were modified in each case from those cited in this test method.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units 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 determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>3</sup>

- A262** Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
- D1193** Specification for Reagent Water
- E3** Guide for Preparation of Metallographic Specimens
- E7** Terminology Relating to Metallography

<sup>1</sup> This test method 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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<sup>2</sup> The boldface numbers in parentheses refer to a list of references at the end of this standard.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- E112** Test Methods for Determining Average Grain Size
- G1** Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens
- G3** Practice for Conventions Applicable to Electrochemical Measurements in Corrosion Testing
- G5** Reference Test Method for Making Potentiodynamic Anodic Polarization Measurements
- G15** Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)<sup>4</sup>
- G28** Test Methods for Detecting Susceptibility to Intergranular Corrosion in Wrought, Nickel-Rich, Chromium-Bearing Alloys
- G61** Test Method for Conducting Cyclic Potentiodynamic Polarization Measurements for Localized Corrosion Susceptibility of Iron-, Nickel-, or Cobalt-Based Alloys

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *integrated charge ( $Q$ )*—the charge measured, in coulombs, during reactivation as given by the time integral of current density below the reactivation peak of the curve.

3.1.2 *maximum anodic current density ( $I_r$ )*—the current density measured at the peak of the anodic curve during reactivation.

3.1.3 *normalized charge ( $P_a$ )*—the integrated current normalized to the specimen size and grain size.  $P_a$  represents the charge (in coulombs/cm<sup>2</sup>) of the grain-boundary area. The method for calculating  $P_a$  is given in **9.2**.

3.1.4 *reactivation*—in the electrochemical reactivation (EPR) test, the potential sweep from the passivation potential returning to the corrosion potential.

3.1.5 *scan rate*—the rate at which the electrical potential applied to a specimen in a polarization test is changed.

## 4. Summary of Test Method

4.1 The EPR test is accomplished by a potentiodynamic sweep from the passive to the active regions of electrochemical potentials in a process referred to as reactivation. The EPR test

<sup>4</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).