



Standard Test Method for Determining Stress-Corrosion Cracking Resistance of Heat-Treatable Aluminum Alloy Products Using Breaking Load Method¹

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1. Scope

1.1 This test method covers procedures for evaluation of stress corrosion cracking (SCC) resistance by the breaking load test method, a concept which uses residual strength as the measure of damage evolution (in this case environmentally assisted cracking).

1.2 This test method covers specimen type and replication, test environment, stress levels, exposure periods, final strength determination, and statistical analysis of the raw residual strength data.

1.3 The test method was developed for use with heat-treatable aluminum alloys, that is, 2XXX alloys and 7XXX with 1.2 to 3.0 % Cu, and test specimens oriented in the short-transverse direction relative to grain structure (1, 2).² However, the residual strength measurements and the statistics used to analyze the data are not specific to heat-treatable aluminum alloys and can be used for other specimen orientations and different types of materials.

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.*

2. Referenced Documents

2.1 ASTM Standards:³

E8 Test Methods for Tension Testing of Metallic Materials

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

¹ This test method is under the jurisdiction of ASTM Committee G01 on Corrosion of Metals and is the direct responsibility of Subcommittee G01.06 on Environmentally Assisted Cracking.

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² The boldface numbers in parentheses refer to the list of references at the end of the standard.

³ 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.

G44 Practice for Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5 % Sodium Chloride Solution

G47 Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products

G49 Practice for Preparation and Use of Direct Tension Stress-Corrosion Test Specimens

G64 Classification of Resistance to Stress-Corrosion Cracking of Heat-Treatable Aluminum Alloys

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *censor*—a statistical term indicating that the value from an individual observation may fall outside of the range that can be measured because of test procedures or conditions.

3.1.2 *sample*—the nominally uniform, bulk material from which individual stress-corrosion cracking specimens are obtained.

4. Summary of Test Method

4.1 This test method describes a procedure for using residual strength after exposure to a corrosive environment to evaluate stress corrosion cracking susceptibility in heat treatable aluminum alloy product forms such as sheet, plate, extrusions, forgings, and bar. These products generally are most susceptible to SCC in the long transverse direction of sheet, the short transverse direction of plate, extrusions and forgings, and the transverse direction of rod and bar stock. In this test, tensile bars or direct tension sheet specimens, prepared according to Practice G49, are exposed to 3.5 weight % aqueous sodium chloride solution (Practice G44), are removed before they fail and are tension tested to determine the amount of corrosion damage that has occurred. The average retained strength is then calculated and the Box-Cox Transformation can be used for statistical analysis of the results.

4.2 The procedure calls for exposure of unstressed specimens which are used to factor out the effects of pitting, intergranular, and general corrosion. These phenomena degrade residual strength but do not require applied stress for their occurrence.