



Standard Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products¹

This standard is issued under the fixed designation G47; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers a uniform procedure for characterizing the resistance to stress-corrosion cracking (SCC) of high-strength aluminum alloy wrought products for the guidance of those who perform stress-corrosion tests, for those who prepare stress-corrosion specifications, and for materials engineers.

1.2 This test method covers method of sampling, type of specimen, specimen preparation, test environment, and method of exposure for determining the susceptibility to SCC of 2XXX (with 1.8 to 7.0 % copper) and 7XXX (with 0.4 to 2.8 % copper) aluminum alloy products, particularly when stressed in the short-transverse direction relative to the grain structure.

1.3 The values stated in SI units are to be regarded as standard. The inch-pound units in parentheses are provided for information.

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:²

G38 Practice for Making and Using C-Ring Stress-Corrosion Test Specimens

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

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

¹ This test method, which was developed by a joint task group with the Aluminum Association, Inc., 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 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.

G139 Test Method for Determining Stress-Corrosion Cracking Resistance of Heat-Treatable Aluminum Alloy Products Using Breaking Load Method

3. Summary of Test Method

3.1 This test method provides a comprehensive procedure for accelerated stress-corrosion testing high-strength aluminum alloy product forms, particularly when stressed in the short-transverse grain direction. It specifies tests of constant-strain-loaded, 3.18-mm (0.125-in.) tension specimens or C-rings exposed to 3.5 % sodium chloride (NaCl) solution by alternate immersion, and includes procedures for sampling various manufactured product forms, examination of exposed test specimens, and interpretation of test results.

4. Significance and Use

4.1 The 3.5 % NaCl solution alternate immersion test provides a test environment for detecting materials that would be likely to be susceptible to SCC in natural outdoor environments, especially environments with marine influences.^{3,4,5} For determining actual serviceability of a material, other stress-corrosion tests should be performed in the intended service environment under conditions relating to the end use, including protective measures.

4.2 Although this test method is intended for certain alloy types and for testing products primarily in the short-transverse stressing direction, this method is useful for some other types of alloys and stressing directions.

5. Interferences

5.1 A disadvantage of the 3.5 % NaCl solution alternate immersion test is that severe pitting may develop in the

³ Romans, H. B., Stress Corrosion Testing, ASTM STP 425, ASTM, 1967, pp. 182–208.

⁴ Brown, R. H., Sprowls, D. O., and Shumaker, M. B., "The Resistance of Wrought High Strength Aluminum Alloys to Stress Corrosion Cracking," Stress Corrosion Cracking of Metals—A State of the Art, ASTM STP 518, ASTM, 1972, pp. 87–118.

⁵ Sprowls, D. O., Summerson, T. J., Ugiansky, G. M., Epstein, S. G., and Craig, H. L., Jr., "Evaluation of a Proposed Standard Method of Testing for Susceptibility to Stress-Corrosion Cracking of High-Strength 7XXX Series Aluminum Alloy Products," Stress Corrosion-New Approaches, ASTM STP 610, ASTM, 1976, pp. 3–31.