Designation: G 28 – 02

Standard Test Methods of Detecting Susceptibility to Intergranular Corrosion in Wrought, Nickel-Rich, Chromium-Bearing Alloys[1]

This standard is issued under the fixed designation G 28; 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 These test methods cover two tests as follows:

1.1.1 *Method A, Ferric Sulfate-Sulfuric Acid Test* (3-10 , inclusive)—This test method describes the procedure for conducting the boiling ferric sulfate—50 % sulfuric acid test which measures the susceptibility of certain nickel-rich, chromium-bearing alloys to intergranular corrosion (see Terminology G 15), which may be encountered in certain service environments. The uniform corrosion rate obtained by this test method, which is a function of minor variations in alloy composition, may easily mask the intergranular corrosion components of the overall corrosion rate on alloys N10276, N06022, N06059, and N06455.

1.1.2 *Method B, Mixed Acid-Oxidizing Salt Test* (Sections 11-18, inclusive)—This test method describes the procedure for conducting a boiling 23 % sulfuric + 1.2 % hydrochloric + 1 % ferric chloride + 1 % cupric chloride test which measures the susceptibility of certain nickel-rich, chromium-bearing alloys to display a step function increase in corrosion rate when there are high levels of grain boundary precipitation.

1.2 The purpose of these two test methods is to detect susceptibility to intergranular corrosion as influenced by variations in processing or composition, or both. Materials shown to be susceptible may or may not be intergranularly *corroded* in other environments. This must be established independently by specific tests or by service experience.

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.* Hazard advisory statements are given in 5.1.1, 5.1.3, 5.1.9, 13.1.1, and 13.1.11.

2. Referenced Document

2.1 *ASTM Standards:*

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels[2]

D 1193 Specification for Reagent Water[3]

G 15 Terminology Relating to Corrosion and Corrosion Testing[4]

METHOD A—Ferric Sulfate—Sulfuric Acid Test

3. Significance and Use

3.1 The boiling ferric sulfate-sulfuric acid test may be applied to the following alloys in the wrought condition:

Alloy	Testing Time, h
N06007	120
N06022	24
N06030	120
N06059	24
N06200	24
N06455	24
N06600	24
N06625	120
N06686	24
N06985	120
N08020	120
N08367	24
N08800	120
N08825[A]	120
N10276	24

[A] While the ferric sulfate-sulfuric acid test does detect susceptibility to intergranular corrosion in Alloy N08825, the boiling 65 % nitric acid test, Practices A 262, Practice C, for detecting susceptibility to intergranular corrosion in stainless steels is more sensitive and should be used if the intended service is nitric acid.

3.2 This test method may be used to evaluate as-received material and to evaluate the effects of subsequent heat treatments. In the case of nickel-rich, chromium-bearing alloys, the test method may be applied to wrought and weldments of products. The test method is not applicable to cast products.

[1] These test methods are under the jurisdiction of ASTM Committee G01 on Corrosion of Metals and are the direct responsibility of Subcommittee G01.05 on Laboratory Corrosion Tests.

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[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 11.01.

[4] *Annual Book of ASTM Standards*, Vol 03.02.

4. Apparatus

4.1 The apparatus (Note 1) is illustrated in Fig. 1.

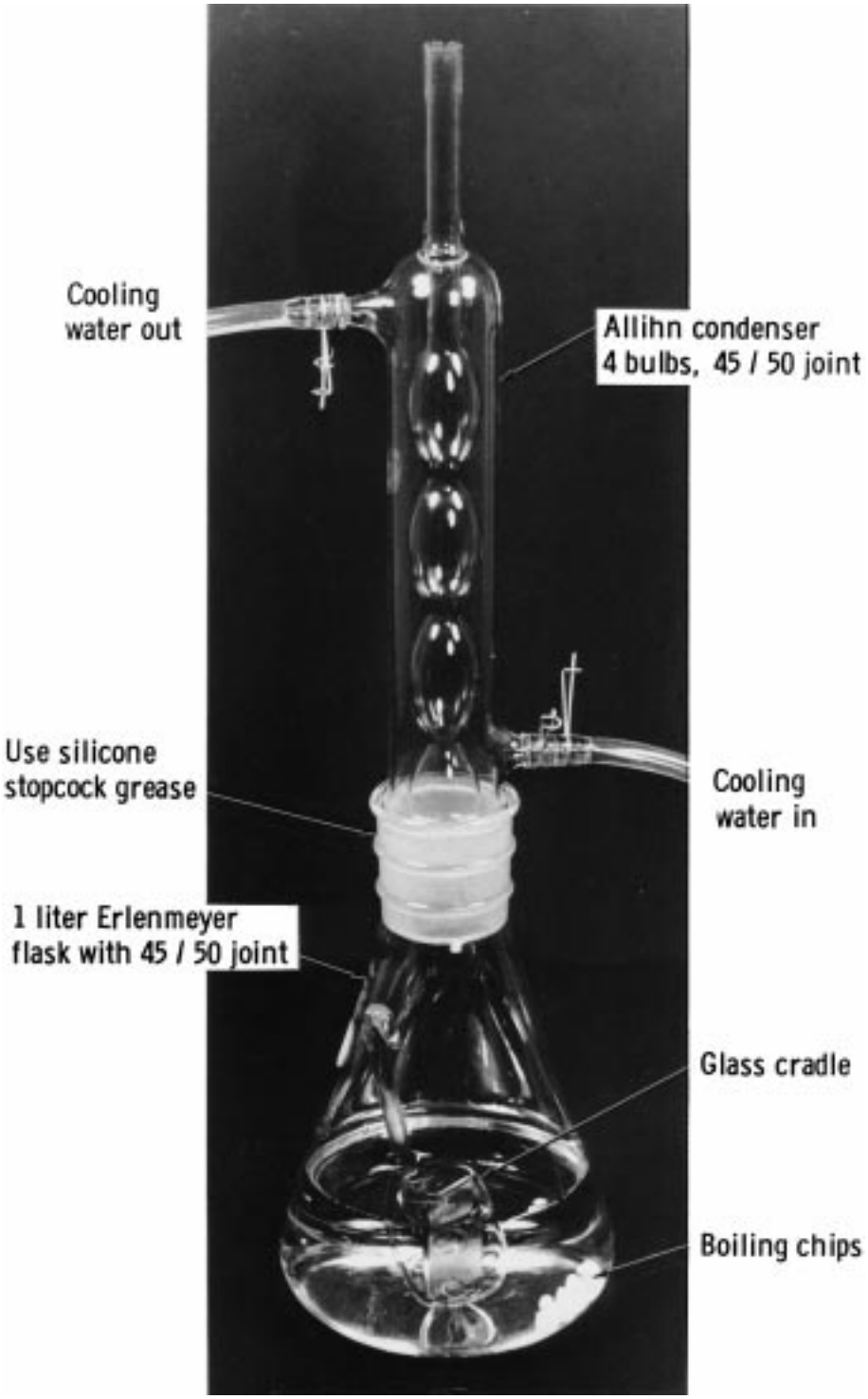

FIG. 1 Apparatus for Ferric Sulfate-Sulfuric Acid Test

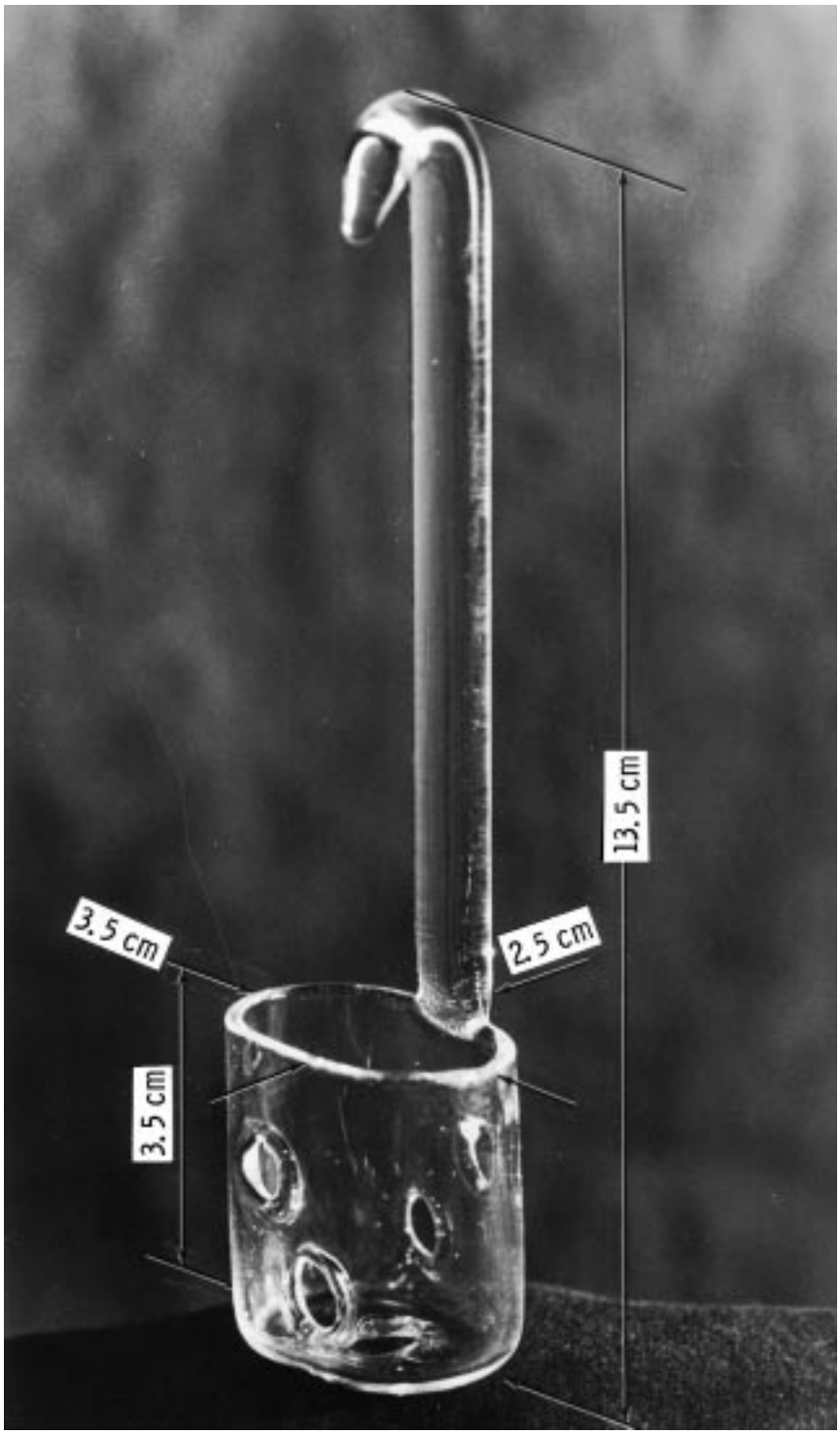

FIG. 2 Glass Cradle

4.1.1 *Allihn or Soxhlet Condenser*, 4-bulb,[5] with a 45/50 ground-glass joint, overall length about 330 mm, condensing section about 240 mm.

4.1.2 *Erlenmeyer Flask*, 1-L, with a 45/50 ground-glass joint. The ground-glass opening shall be 40 mm wide.

4.1.3 *Glass Cradle* (Fig. 2)—To pass through the ground-glass joint on the Erlenmeyer flask, the width of the cradle should not exceed 40 mm and the front-to-back distance must be such that the cradle will fit the 40-mm diameter opening. It

[5] To avoid frequent chipping of the drip-tip of the condenser during handling, the modified condenser described by Streicher, M. A., and Sweet, A. J., *Corrosion*, Vol 25, 1969, pp. 1, has been found suitable for this use.