



Standard Test Method for Electrochemical Critical Pitting Temperature Testing of Stainless Steels¹

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1. Scope

1.1 This test method covers a procedure for the evaluation of the resistance of stainless steel and related alloys to pitting corrosion based on the concept of the determination of a potential independent critical pitting temperature (CPT).

1.2 This test methods applies to wrought and cast products including but not restricted to plate, sheet, tubing, bar, forgings, and welds, (see Note 1).

NOTE 1—Examples of CPT measurements on sheet, plate, tubing, and welded specimens for various stainless steels can be found in Ref. (1).² See the research report.³

1.3 The standard parameters recommended in this test method are suitable for characterizing the CPT of austenitic stainless steels and other related alloys with a corrosion resistance ranging from that corresponding to solution annealed UNS S31600 (Type 316 stainless steel) to solution annealed UNS S31254 (6 % Mo stainless steel).

1.4 This test method may be extended to stainless steels and other alloys related to stainless steel that have a CPT outside the measurement range given by the standard parameters described in this test method. Appropriate test potential and solution must then be determined.

1.5 The values stated in SI units are to be regarded as standard.

1.6 *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:

D 1193 Specification for Reagent Water⁴

E 177 Practice for Use of the Terms Precision and Bias in

ASTM Test Methods⁵

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁵

G 1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens⁶

G 3 Practice for Conventions Applicable to Electrochemical Measurements in Corrosion Testing⁶

G 5 Reference Test Method for Making Potentiostatic and Potentiodynamic Anodic Polarization Measurements⁶

G 15 Terminology Relating to Corrosion and Corrosion Testing⁶

G 46 Guide for Examination and Evaluation of Pitting Corrosion⁶

G 107 Guide for Formats for Collection and Compilation of Corrosion Data for Metals for Computerized Database Input⁶

3. Terminology

3.1 Definitions:

3.1.1 *critical pitting temperature (CPT)*—the lowest temperature on the test surface at which stable propagating pitting occurs under specified test conditions indicated by a rapid increase beyond a set limit of the measured anodic current density of the specimen.

3.1.2 *pitting potential range*—the range of measured potentials where pitting is initiated. This potential range only exists above the minimum critical pitting temperature; see also Appendix X1.

3.1.3 *potential independent CPT*— the CPT determined at a potential above the pitting potential range, but below the transpassive potential; see also Appendix X1.

3.1.4 *potential dependent CPT*—the CPT determined at a potential within the pitting potential range of the tested material; see also Appendix X1.

3.1.5 *temperature ramp*—the rate (°C/min) at which the test temperature is increased during the test.

3.2 *sign conventions*—the sign conventions used in this procedure are in agreement with Practice G 3.

3.3 Unless otherwise stated, this test method uses the general terminology relating to corrosion and corrosion testing as defined in Terminology G 15.

¹ This test method is under the jurisdiction of G-1 on Corrosion of Metals and is the direct responsibility of Subcommittee G01.11 on Electrochemical Measurements in Corrosion Testing.

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

³ See ASTM Research Report G01-1017. Available from ASTM Headquarters.

⁴ Annual Book of ASTM Standards, Vol 11.01.

⁵ Annual Book of ASTM Standards, Vol 14.02.

⁶ Annual Book of ASTM Standards, Vol 03.02.