
**Corrosion of metals and alloys —
Measurement of critical crevice
temperature for cylindrical crevice
geometries in ferric chloride solution**

*Corrosion des métaux et alliages — Mesure de la température critique
de corrosion caverneuse de crevasses de géométries cylindriques dans
une solution de chlorure ferrique*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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Introduction

Various dimensions of pipes and tubes are used in industries such as nuclear power plants, thermal power plants, desalination plants, oil refining facilities and chemical plants, etc. Materials evaluation for these pipes, tubes and fittings makes all the difference to safety and life cycles in these industrial facilities.

There are numerous standards that specify test methods and corrosion resistance for pitting and crevice corrosion. Many of them address the corrosion rate or critical pitting temperature (CPT) or critical crevice temperature (CCT) of plate type specimens, but they are not concerned with other geometries and relations of corrosion resistance between geometries.

It is important that the initiation temperature of crevice corrosion be measured in cylindrical crevice geometries for high corrosion resistant alloys, including from traditional stainless steels (300 series) to super stainless steels (higher alloyed stainless steels).

This document provides the test method that measures crevice corrosion resistance in crevice geometries such as tube/tube sheet of heat exchangers and pipes/pipe supports, flange/couplings, bolts/nuts, etc. in industrial facilities. It can be used as a guideline which offers the criterion for materials selection of such components.

Most crevice corrosion tests are performed conforming to some standards, but these test methods use a flat geometry of an artificial crevice which shows different critical crevice temperatures to those of cylindrical crevice geometry. Therefore, results of these tests have created controversies in related industries. It has been found that the identical CCT between plate type and cylindrical type specimens could be achieved with an appropriate torque applied to the cylindrical specimen.

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Corrosion of metals and alloys — Measurement of critical crevice temperature for cylindrical crevice geometries in ferric chloride solution

1 Scope

This document specifies a methodology for ranking the crevice corrosion resistance of stainless steels and related alloys when exposed to oxidizing chloride solution. This document allows the measurement of critical crevice temperatures of tube/rod type specimens equal to those of plate type ones made up of the same material by chemical initiation of crevice corrosion, but not by the electrochemical method of ISO 18070. The test method in this document defines the apparatus and the procedure used to measure the temperature of crevice corrosion initiated in pipes and tubes using cylindrical specimens. This method has also been proved to apply to plate type specimens.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8044, *Corrosion of metals and alloys — Basic terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8044 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

critical crevice temperature

CCT

minimum temperature required to produce a crevice attack of at least 0,025 mm corroded depth on the bold surface of a specimen beneath the *crevice former* (3.2), with the edge attack ignored

Note 1 to entry: Measured in degrees Celsius.

3.2

crevice former

component of the crevice corrosion test tool assembly, which allows crevice corrosion to be induced in a contacted test specimen by applying certain torques

4 General principles

4.1 Objective

This document describes laboratory tests for measuring CCT of stainless steels and high corrosion resistant alloys with cylindrical (including circular arc) and flat plate geometries in oxidizing chloride solutions. Cylindrical crevice geometries emulate crevices frequently coming from tube/tube sheet