SLOVENSKI STANDARD
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Korozija kovin in zlitin - Vrednotenje jamičaste korozije (ISO/DIS 11463:2019)

Corrosion of metals and alloys - Evaluation of pitting corrosion (ISO/DIS 11463:2019)

Korrosion von Metallen und Legierungen - Bewertung der Lochkorrosion (ISO/DIS 11463:2019)

Corrosion des métaux et alliages - Évaluation de la corrosion par piqûres (ISO/DIS 11463:2019)

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Corrosion of metals and alloys — Evaluation of pitting corrosion

Corrosion des métaux et alliages — Évaluation de la corrosion par piqûres

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Foreword

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For an explanation on 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.

The committee responsible for this document is ISO/TC 156, *Corrosion of metals and alloys*. WG 6, *General principles of testing and data interpretation*..

This third edition cancels and replaces the first edition (ISO 11463:1995), which has been technically revised.

Introduction

It is important to be able to determine the extent of pitting and its characteristics, either in a service application, where it is necessary to estimate the remaining life in a metal structure, or in laboratory test programmes that are used to select pitting-resistant materials for a particular service (see[1] in Bibliography). Corrosion pits can also act as the precursor to other damage modes such as stress corrosion cracking and corrosion fatigue.

The application of the materials to be tested will determine the minimum pit size to be evaluated and whether total area covered, average pit depth, maximum pit depth or another criterion is the most important to measure.

Corrosion of metals and alloys — Evaluation of pitting corrosion

1 Scope

This document provides guidance on the selection of procedures that can be used in the identification and examination of corrosion pits and in the evaluation of pitting corrosion and pit growth rate.

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 8407, *Corrosion of metals and alloys — Removal of corrosion products from corrosion test specimens*

ISO 14802, *Corrosion of metals and alloys — Guidelines for applying statistics to analysis of corrosion data*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Identification and examination of pits

4.1 Preliminary low magnification visual inspection

4.1.1 A visual examination of the corroded metal surface with or without the use of a low-power magnifying glass may be used to determine the extent of corrosion and the apparent location of pits. It is often advisable to photograph the corroded surface so that it can be compared with the clean surface after the removal of corrosion products or with a fresh unused piece of material.

4.1.2 If the metal specimen has been exposed to an unknown environment, the composition of the corrosion products may be of value in determining the cause of corrosion. Recommended procedures for the removal of particulate corrosion products should be followed and the material removed should be preserved for future identification.

4.1.3 To expose the pits fully, it is recommended that cleaning procedures should be used to remove the corrosion products. Rinsing with water followed by light mechanical cleaning can be sufficient for lightly adhered corrosion product but for more adherent product chemical cleaning is required. ISO 8407 provides a range of chemical cleaning processes, but preliminary testing should be undertaken to ensure that attack of the base metal is avoided.

4.2 Optical microscopic examination of pit size and shape

4.2.1 Examine the cleaned metal surface to determine the approximate size and distribution of pits. Follow this procedure by a more detailed examination through a microscope using low magnification (approximately ×20). Pits may have various sizes and shapes. A visual examination of the metal surface may show a round, elongated or irregular opening, but it seldom provides an accurate indication of the

extent of corrosion beneath the surface. Thus, it is often necessary to cross-section the pit to determine its actual shape. Several common variations in the cross-sectioned shape of pits are shown in Figure 1.

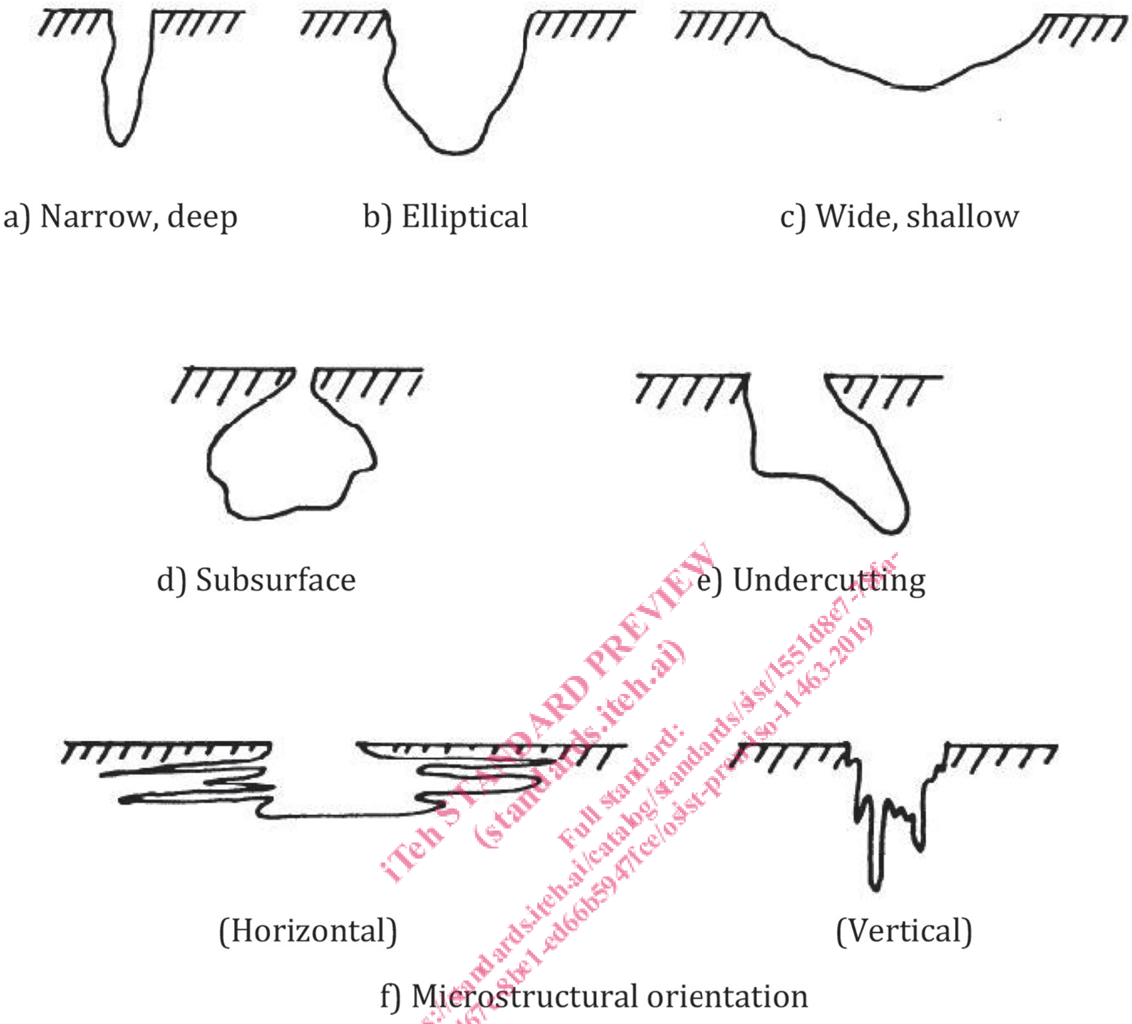

Figure 1 — Variations in the Cross-sectional shape of pits

4.2.2 It is difficult to determine pit density by counting pits through a microscope eyepiece, but the task may be made easier by the use of a plastic grid. Place the grid, containing 3 mm to 6 mm squares, on the metal surface. Count and record the number of pits in each square and move across the grid in a systematic manner until all the surface has been covered. This approach minimizes eye-strain because the eyes can be taken from the field of view without fear of losing the area of interest. Enlarged photographs of the area of interest may also be used to reduce eyestrain. An alternative approach is to mount the specimen on an x-y stage and measure both the number and spatial distribution of pits. When coupled with optical depth measurement, where applicable, the number, depth and spatial distribution of pits can be determined.

4.2.3 Advanced optical microscopy techniques, such as infinite focus microscopy and confocal laser microscopy may be used to obtain three-dimensional images of the pit surface, within the constraints of optical observations (most relevant to Fig. 1 a-c but not applicable to undercut). Such measurements can be used to view the surface features and quantify surface roughness, pit depth, surface profile, etc.

4.2.4 To carry out a metallographic examination, select and cut out a representative portion of the metal surface containing the pits and prepare a metallographic specimen. If corrosion products are to be examined in cross-section, it may be necessary to fix the surface in a mounting compound before