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PEOPLE'S REPUBLIC OF CHINA

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**Corrosion of metals and alloys - Evaluation of pitting
corrosion**

金属和合金的腐蚀 点蚀评定方法

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Table of Contents

Foreword	3
ISO Foreword	4
ISO Introduction	5
1 Scope	6
2 Normative references	6
3 Identification and examination of pits	6
4 Extent of pitting.....	9
5 Evaluation of pitting.....	11
6 Report	15
7 Additional information	16
Annex A (Informative) Repeatability of measurements by use of a microscope	17
Annex B (Informative) References	19

Foreword

This Standard is identical to the international standard ISO 11463:1995 *Corrosion of metals and alloys - Evaluation of pitting corrosion*.

This Standard replaces Annex A of GB/T 17897-1999 from the date of implementation.

Both Annexes A and B of this Standard are informative.

This Standard was proposed by the original State Metallurgical Bureau.

This Standard shall be under the jurisdiction of the China Metallurgical Information and Standardization Institute.

Drafting organization of this Standard: Central Iron & Steel Research Institute.

Chief drafting staff of this Standard: Hu Xiaoping.

Corrosion of metals and alloys - Evaluation of pitting corrosion

1 Scope

This Standard gives guidance on the selection of procedures that can be used in the identification and examination of pits and in the evaluation of pitting corrosion.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

GB/T 16545-1996, Corrosion of metals and alloys - Removal of corrosion products from corrosion test specimens (idt ISO 8407:1991)

3 Identification and examination of pits

3.1 Visual inspection

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.

3.1.1 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 in the removal of particulate corrosion products should be followed and reserved for future identification.

3.1.2 To expose the pits (as shown in a, b, c of Figure 1) fully, it is recommended that cleaning procedures should be used to remove the corrosion products and avoid solutions that attack the base metal excessively (see GB/T 16545). It may be advisable during cleaning to probe the pits with a pointed tool to determine the extent of undercutting or subsurface corrosion (see Figure 1). However, scrubbing with a stiff-bristle brush will often enlarge the pit openings sufficiently by removal of corrosion products or undercut metal to make the pits easier to evaluate.

or alternative way is to section slightly away from the pit and slowly grind until the pit is in the cross-section. Sectioning through a pit can be difficult and one may miss the deepest portion. The depth of the pit is measured on the flat, polished surface by the use of a microscope with a calibrated eyepiece. The method is very accurate, but it requires good operator skill and good judgment in the selection of the pit and good technique in cutting through the pit. Its limitations are that it is time-consuming, the deepest pit may not have been selected and the pit may not have been sectioned at the deepest point of penetration. The method, however, is the only suitable for the evaluation of the pit shape as in Figure 1.

4.2.2 Machining

See [2] and [3] in Annex B.

4.2.2.1 This method requires a sample that is fairly regular in shape, and it usually involves the destruction of the specimen. Measure the thickness of the specimen between two areas that have not been affected by general corrosion. Select a portion of the surface on one side of the specimen that is relatively unaffected; then machine the opposite surface where the pits are located on a precision lathe, grinder or mill until all signs of corrosion have disappeared. Some difficulty from galling and smearing may be encountered with soft metals and pits may be obliterated. Conversely, inclusions may be removed from the metal thus confusing examination. Measure the thickness of the specimen between the unaffected surface and subtract from the original thickness to give the maximum depth of pitting. Repeat this procedure on the unmachined surface unless the thickness has been reduced by 50% or more during the machining of the first side.

4.2.2.2 This method is equally suitable for determining the number of pits with specific depths. Count the visible pits then machine away the surface of the metal in measured stages and count the number of visible pits remaining at each stage. Subtract the number of pits at each stage from the count at the previous stage to obtain the number of pits at each depth of cut. Count at the previous stage to obtain the number of pits at each depth of cut.

4.2.3 Micrometer or depth gauge

4.2.3.1 This method is based on the use of a pointed needle attached to a micrometer or calibrated depth gauge to penetrate the pit cavity. Remove surrounding corrosion products or debris thoroughly then zero the instrument on an unaffected area at the lip of the pit. Insert the needle in the pit until it reaches the base. The distance travelled by the needle is the depth of the pit. It is best to use constant-tension instruments to minimize metal penetration at the base of the pit. It may be advantageous to use a stereomicroscope in conjunction with this technique so that the pit can be magnified to ensure that the needle point is at the bottom of the pit. The method is limited to pits that have a sufficiently large opening to accommodate the needle without obstruction. This eliminates those pits which have undercutting or strong directional orientation.

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