

Corrosion of metals and alloys - Accelerated cyclic tests with exposure to acidified salt spray, "dry" and "wet" conditions

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 16151:2008 sisaldab Euroopa standardi EN ISO 16151:2008 ingliskeelset teksti.</p> <p>Standard on kinnitatud Eesti Standardikeskuse 20.06.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 16.04.2008.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 16151:2008 consists of the English text of the European standard EN ISO 16151:2008.</p> <p>This standard is ratified with the order of Estonian Centre for Standardisation dated 20.06.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.</p> <p>Date of Availability of the European standard text 16.04.2008.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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English Version

Corrosion of metals and alloys - Accelerated cyclic tests with
exposure to acidified salt spray, "dry" and "wet" conditions (ISO
16151:2005)

Corrosion des métaux et alliages - Essais cycliques
accélérés avec exposition au brouillard salin acidifié, en
conditions "sèches" et en conditions "humides" (ISO
16151:2005)

Korrosion von Metallen und Legierungen -
Schnellprüfungen unter wechselnder Einwirkung von
saurem Salzsprühnebel, "trockenen" und "feuchten"
Bedingungen (ISO 16151:2007)

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Management Centre: rue de Stassart, 36 B-1050 Brussels

Foreword

The text of ISO 16151:2005 has been prepared by Technical Committee ISO/TC 156 "Corrosion of metals and alloys" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 16151:2008 by Technical Committee CEN/TC 262 "Metallic and other inorganic coatings" the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2008, and conflicting national standards shall be withdrawn at the latest by October 2008.

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Endorsement notice

The text of ISO 16151:2005 has been approved by CEN as a EN ISO 16151:2008 without any modification.

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Introduction

Corrosion of metallic materials, with or without corrosion protection, is influenced by many environmental factors, the importance of which may vary with the type of metallic material and with the type of environment. It is impossible, therefore, to design accelerated laboratory corrosion tests in such a way that all environmental factors influencing resistance to corrosion are taken into account. Laboratory tests are, therefore, designed to simulate the effects of the most important factors, which enhance the corrosion of metallic materials.

The accelerated corrosion-test methods described in this International Standard are designed to simulate and enhance the environmental influence on a metallic material to outdoor climates, where exposure to acid rain and to salt-contaminated conditions occur and may promote corrosion. It has been prepared by reference to technical papers and reports (see the Bibliography).

The test methods involve cyclic exposure of test specimens to a mist of acidified-salt solution, to drying conditions, and to periods of high humidity. However, the methods are mainly intended for comparative testing and the results obtained do not permit far-reaching conclusions on the corrosion resistance of the tested metallic material under the whole range of environmental conditions in which they may be used. Nevertheless, the methods provide valuable information on the relative performance of materials exposed to salt/acid rain environments similar to those employed in the test.

Corrosion of metals and alloys — Accelerated cyclic tests with exposure to acidified salt spray, “dry” and “wet” conditions

1 Scope

This International Standard specifies two accelerated corrosion-test procedures, Methods A and B, for the comparative evaluation of metallic materials with or without permanent corrosion protection or temporary corrosion protection in outdoor salt/acid rain environments. It also specifies the apparatus used. The two tests involve cyclic exposure of the specimens to acidified salt spray, “dry” and “wet” conditions.

The particular advantages of the two tests over conventional accelerated tests, such as the neutral salt spray test (NSS) as specified in ISO 9227 lie in their better ability to reproduce the corrosion that occurs in outdoor salt/acid rain environments. They are also useful for evaluating cosmetic corrosion.

Method A applies to

- metals and their alloys,
- metallic coatings (cathodic),
- anodic oxide coatings, and
- organic coatings on metallic materials.

Method B applies to

- steel coated with anodic coatings, and
- steel coated with anodic coatings covered with conversion coatings.

2 Normative references

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

ISO 4628-1:2003, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 1: General introduction and designation system*

ISO 4628-2:2003, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

ISO 4628-3:2003, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting*

ISO 4628-4:2003, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 4628-5:2003, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*

ISO 8407:1991¹⁾, *Corrosion of metals and alloys — Removal of corrosion products from corrosion test specimens*

ISO 8993:1989, *Anodized aluminium and aluminium alloys — Rating system for the evaluation of pitting corrosion — Chart method*

ISO 9227:1990¹⁾, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 10289:1999, *Method for corrosion testing of metallic and other inorganic coatings on metallic substrate — Rating of test specimens and manufactured articles subjected to corrosion tests*

ISO 11130:1999, *Corrosion of metals and alloys — Alternate immersion test in salt solution*

3 Test solution

The following clauses give instructions for the preparation and use of the solutions used in Methods A and B.

3.1 Method A

3.1.1 Preparation of acidic 5 % sodium chloride solution

3.1.1.1 Neutral 5 % sodium chloride solution

A sufficient mass of sodium chloride shall be dissolved in distilled or deionized water, with a conductivity not higher than 20 $\mu\text{S}/\text{cm}$ at $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, to produce a concentration of $50\text{ g/l} \pm 5\text{ g/l}$. The specific gravity range for a $50\text{ g/l} \pm 5\text{ g/l}$ solution shall be 1,029 to 1,036 at $25\text{ }^{\circ}\text{C}$.

The sodium chloride shall contain less than 0,001 % mass fraction of copper and less than 0,001 % mass fraction of nickel, as determined by atomic absorption spectrophotometry or another analytical method of similar sensitivity. It shall not contain more than 0,1 % mass fraction of sodium iodide, or more than a mass fraction of total impurities of 0,5 % calculated for dry salt.

If the pH of the prepared solution, measured at $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, is outside the range 6,0 to 7,0, investigate the presence of undesirable impurities in the salt and/or the water.

3.1.1.2 Acidification

The pH of the solution shall be adjusted to a value of $3,5 \pm 0,1$ at $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, by adding the following reagents to 10 litres of the prepared neutral 5 % sodium chloride solution as follows:

- 12 ml of nitric acid (HNO_3 , $\rho = 1,42\text{ g/ml}$);
- 17,3 ml of sulfuric acid (H_2SO_4 , $\rho = 1,84\text{ g/ml}$);
- a sufficient quantity of 10 % mass fraction of sodium hydroxide (NaOH) solution, to adjust the pH of the solution to $3,5 \pm 0,1$ (about 300 ml will be required).

1) Under revision.