Paints and varnishes - Determination of resistance to cyclic corrosion conditions - Part 1: Wet (salt fog)/dry/humid (ISO 11997-1:2017)

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 11997-1:2017 sisaldab Euroopa standardi EN ISO 11997-1:2017 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 11997-1:2017 consists of the English text of the European standard EN ISO 11997-1:2017.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 27.09.2017.	Date of Availability of the European standard is 27.09.2017.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 87.040

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 11997-1

September 2017

ICS 87.040

Supersedes EN ISO 11997-1:2006

English Version

Paints and varnishes - Determination of resistance to cyclic corrosion conditions - Part 1: Wet (salt fog)/dry/humid (ISO 11997-1:2017)

Peintures et vernis - Détermination de la résistance aux conditions de corrosion cyclique - Partie 1: Brouillard salin/sécheresse/humidité (ISO 11997-1:2017)

Beschichtungsstoffe - Bestimmung der Beständigkeit bei zyklischen Korrosionsbedingungen - Teil 1: Nass (Salzsprühnebel)/trocken/Feuchte (ISO 11997-1:2017)

This European Standard was approved by CEN on 12 July 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 11997-1:2017 E

European foreword

This document (EN ISO 11997-1:2017) has been prepared by Technical Committee ISO/TC 35 “Paints and varnishes” in collaboration with Technical Committee CEN/TC 139 “Paints and varnishes” the secretariat of which is held by DIN.

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 March 2018, and conflicting national standards shall be withdrawn at the latest by March 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 11997-1:2006.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 11997-1:2017 has been approved by CEN as EN ISO 11997-1:2017 without any modification.

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 11997-1:2005), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the time for no drops of moisture are visible on the panels (see 6.4) has been changed;

— a reference to ISO 4628-8 for assessment of degree of delamination and corrosion around a scribe or other artificial defect has been added;

— a reference to ISO 4620-10 for assessment of degree of filiform corrosion has been added;

— the supplementary test conditions previously in Annex A have been integrated in the test report;

— the numbering and order of annexes has been changed;

— the adjustment procedure for the pH of the salt solution in Annex A to Annex D has been implemented from ISO 9227;

— the text has been harmonized with the latest edition of ISO 9227 where possible.

A list of all parts in the ISO 11997 series can be found on the ISO website.

Introduction

Coatings of paints, varnishes and similar materials are exposed to one of four cycles of wet and dry conditions specified in this document (see Annex A to Annex D), using specified salt solutions in a cabinet in order to simulate, in the laboratory, processes occurring in aggressive outdoor conditions, such as marine environments. Generally, correlation between such outdoor weathering and laboratory testing cannot be expected because of the large number of factors influencing the breakdown process. Correlation can only be expected if the effect on the coating of important parameters (e.g. the nature of the pollutant, the spectral distribution of the incident irradiance in the relevant photochemical region, the temperature of the specimen, the type and cycle of wetting and relative humidity) is known. In contrast to outdoor weathering, laboratory testing in a cabinet is performed with a reduced number of variables which can be controlled, and therefore the effects are more reproducible. The method described may also give a means of checking that the quality of a paint or paint system is being maintained.

The method has been found to be useful in comparing the cyclic salt spray resistance of different coatings. It is most useful in providing relevant ratings for a series of coated panels exhibiting significant differences in cyclic salt spray resistance.

The test cycles included in this document have been used successfully, with documented evidence, in the industry for the assessment of performance. The cycles can be summarized as follows.

— **Cycle A (see Annex A)**: This cycle is specified in Japanese Automobile Standards JASO M 609-91 and JASO M610-92.

— **Cycle B (see Annex B)**: This is based on the VDA 621-415 cycle and is widely used in Europe. It has also been shown to give good correlation with natural weathering for thermosetting paints in vehicle corrosion.

— **Cycle C (see Annex C)**: This cycle was developed in the UK for use with water-soluble and latex paint systems and has been shown to give good correlation with natural weathering.

— **Cycle D (see Annex D)**: This cycle is specified in Japanese Standard JIS K 5621-2003.

It is intended that other cycles will be added at later revisions of this document, as they are developed for evaluating other paint types.

ISO 11997-2 describes a method for determining the cyclic corrosion resistance of paints which includes UV exposure as part of the cycle. It has been found to give good correlation with natural weathering for industrial maintenance coatings.

Paints and varnishes — Determination of resistance to cyclic corrosion conditions —

Part 1: Wet (salt fog)/dry/humid

1 Scope

This document specifies a method for the determination of the resistance of coatings to one of four defined cycles of wet (salt fog)/dry/humid conditions using specified solutions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1513, *Paints and varnishes — Examination and preparation of test samples*

ISO 1514, *Paints and varnishes — Standard panels for testing*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 4628-1, *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, *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, *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, *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, *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 4628-8, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 8: Assessment of degree of delamination and corrosion around a scribe or other artificial defect*

ISO 4628-10, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 10: Assessment of degree of filiform corrosion*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

ISO 17872:2007, *Paints and varnishes — Guidelines for the introduction of scribe marks through coatings on metallic panels for corrosion testing*

3 Terms and definitions

No terms and definitions are listed in this document.

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

4 Principle

A coated test panel is exposed to a cyclic wet (salt fog), drying and humidity test schedule and the effects of exposure are evaluated by criteria agreed in advance between the interested parties, these criteria usually being of a subjective nature.

5 Salt fog test solution

Prepare the salt fog test solution by dissolving the salt or salts as given in Annexes A, B, C and D in water conforming to at least grade 2 of ISO 3696 to produce the required concentration.

The salts shall be of analytical grade and contain a mass fraction of the heavy metals of copper (Cu), nickel (Ni) and lead (Pb) in total less than 0,005 %. It shall not contain a mass fraction of sodium iodide more than 0,1 % and a mass fraction of total impurities more than 0,5 % calculated for dry salt.

NOTE 1 Sodium chloride with anti-caking agents can act as corrosion inhibitors or accelerators. A useful sodium chloride salt grade is a grade named Ph. Eur/USP or JIS, ACS.

If the pH of the solution is outside the required range (see Annexes A, B, C and D), the presence of undesirable impurities in the salt or the water or both shall be investigated. Check the pH using electrometric measurement. Measurements of pH shall be done using electrodes suitable for measuring in weakly buffered sodium chloride solutions in deionized water. Any necessary corrections shall be made by adding hydrochloric acid, sodium hydrogen carbonate or analytical-grade sodium hydroxide, of appropriate concentrations.

NOTE 2 Attention is drawn to the possible changes in pH resulting from loss of carbon dioxide from the solution when it is sprayed or from dissolution of carbon dioxide from the ambient atmosphere. Such changes can be avoided by reducing the carbon dioxide content of the solution by, for example, heating it to a temperature above 35 °C before it is placed in the cabinet or making the solution from freshly boiled water.

Filter the solution before placing it in the reservoir of the cabinet in order to remove any solid matter which might block the apertures of the spraying device.

6 Apparatus

Ordinary laboratory apparatus and glassware, together with the following.

6.1 Spray cabinet, made of, or lined with, material resistant to corrosion by the sprayed solution and having a roof which prevents condensed moisture dripping onto the test specimens. Due to the limited capacity of cabinets smaller than 0,4 m^3, the effect of the loading of the cabinet on the distribution of the

