

INTERNATIONAL STANDARD

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

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

*Peintures et vernis — Détermination de la résistance aux conditions de
corrosion cyclique —*

Partie 1: Brouillard salin/sécheresse/humidité



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ISO 11997-1:2005(E)

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 11997-1 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This second edition cancels and replaces the first edition (ISO 11997-1:1998) (including Technical Corrigendum ISO 11997-1:1998/Cor.1:1998), in which cycle A has been revised and cycle D has been added to correlate with ISO 14993:2001, *Corrosion of metals and alloys — Accelerated testing involving cyclic exposure to salt mist, “dry” and “wet” conditions*.

ISO 11997 consists of the following parts, under the general title *Paints and varnishes — Determination of resistance to cyclic corrosion conditions*:

- *Part 1: Wet (salt fog)/dry/humidity*
- *Part 2: Wet (salt fog)/dry/humidity/UV light*

Introduction

Coatings of paints, varnishes and similar materials are exposed to one of four cycles of wet and dry conditions 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 part of ISO 11997 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 C):** This cycle is specified in Japanese Automobile Standards JASO M 609-91, *Corrosion test method for automotive materials*, and JASO M610-92, *Cosmetic corrosion test method for automotive parts*.
- **Cycle B (see Annex D):** 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 E):** 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 F):** This cycle is specified in Japanese Standard JIS K 5621-2003, *Anticorrosive paint for general use*.

It is intended that other cycles will be added at later revisions of this part of ISO 11997, 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/humidity

1 Scope

This part of ISO 11997 describes a method for the determination of the resistance of coatings to one of four defined cycles of wet (salt fog)/dry/humidity conditions using specified solutions.

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 1513, *Paints and varnishes — Examination and preparation of samples for testing*

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 paint 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 paint 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 paint 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 paint 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 paint coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*

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

ISO 11997-1:2005(E)**3 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.

4 Required supplementary information

For any particular application, the test method described in this part of ISO 11997 needs to be completed by the supplementary information given in Annex A.

5 Salt fog test solution

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

The salts shall be of analytical grade or visually white, and conform with the purity requirements given in Table 1.

Table 1 — Purity of salts

Impurity	Maximum mass fraction of impurity %	Method of determination
Total	0,5	Calculated as a percentage of the dry salt
Iodide	0,1	Calculated as a percentage of the dry salt
Copper	0,001	Determined by spectrophotometry or another method of similar accuracy
Nickel	0,001	Determined by spectrophotometry or another method of similar accuracy

If the pH of the solution is outside the required range (see Annexes C, D, E and F), the presence of undesirable impurities in the salt or the water or both shall be investigated. The pH determination shall be based on electrometric measurement at 25 °C, but a narrow-range indicator paper which can be read in increments of 0,3 pH-units or less and which has been calibrated against electrometric measurements may be used in routine checks. Any necessary corrections shall be made by adding hydrochloric acid, sodium hydrogen carbonate (both of purity conforming to the requirements of Table 1) or analytical-grade sodium hydroxide, of appropriate concentrations.

NOTE 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 may 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.