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

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

iTeh STANDARD PREVIEW
*Peintures et vernis — Détermination de la résistance aux conditions
de corrosion cyclique —
Partie 2: Brouillard salin/sécheresse/humidité/lumière UV*
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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. 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. 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.

The committee responsible for this document is 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 11997-2:2000), which has been technically revised. The main technical changes are:

- a) alternative test procedures have been added as an informative annex;
- b) the supplementary test conditions (formerly Annex A) have been incorporated in the test report.

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*

This part of ISO 11997 is equivalent to ASTM D 5894, *Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)*.

Introduction

Coatings of paints, varnishes and similar materials are exposed to cyclic wet and dry corrosion and UV exposure conditions using specified salt solutions in cabinets in order to simulate, in the laboratory, processes occurring in aggressive outdoor conditions. Generally, valid correlations between such outdoor weathering and laboratory testing cannot be expected because of the large number of factors influencing the breakdown process. Certain relationships can only be expected if the effect on the coating of the important parameters (e.g. nature of the pollutant, spectral distribution of the incident irradiance in the relevant photochemical region, temperature of the specimen, 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 can give a means of checking that the quality of a paint or paint system is being maintained. The method is intended to provide a more realistic simulation of these factors than is found in traditional tests with continuous exposure to a static set of corrosive conditions. 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/UV exposure resistance tested at the same time and to the same test cycle.

The cycle specified in this part of ISO 11997 has been found useful for air-drying industrial maintenance coatings on steel; other cycles may be used as required.

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

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

1 Scope

This part of ISO 11997 specifies a test method of determining resistance of coatings to a defined cycle of wet (salt fog)/dry/humidity/UV light conditions using a specified solution.

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 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 4628-6, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method*

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 11997-2:2013(E)

ISO 11997-1:2005, *Paints and varnishes — Determination of resistance to cyclic corrosion conditions — Part 1: Wet (salt fog)/dry/humidity*

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

ISO 16474-3:—¹⁾, *Paints and varnishes — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

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

3 Principle

A coated test panel is exposed to a cyclic wet (salt fog), drying, humidity and UV light 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 Salt fog test solution

4.1 Prepare the spray solution by dissolving sodium chloride and ammonium sulfate in water of grade 1 or grade 2 quality as defined in ISO 3696 to give a solution with $c(\text{NaCl}) = (0,50 \pm 0,01)$ g/l and $c[(\text{NH}_4)_2\text{SO}_4] = (3,50 \pm 0,01)$ g/l.

4.2 The salts shall be white and comply with the purity requirements given in [Table 1](#).

Table 1 — Purity of salt

Impurity	Maximum mass percentage of impurity ISO 11997-2:2013 % (calculated on the dry salt)
Total	0,5
Iodine	0,1
Copper	0,001
Nickel	0,001

4.3 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.

5 Apparatus

Ordinary laboratory apparatus and glassware, together with the following:

5.1 Artificial weathering cabinet, conforming to the requirements of ISO 16474-3, fitted with UVA 340 lamps and set to repeat a test cycle consisting of light (UV) at 60 °C black panel temperature and condensation in the dark period at 50 °C, unless otherwise specified. The cycle used is 4 h light (UV) and 4 h condensation.

5.2 Cyclic corrosion cabinet, conforming to the requirements of ISO 11997-1.

If the cabinet ([5.1](#) or [5.2](#)) has been used for a spray test, or for any other purpose, using a solution differing from that specified for the current test cycle, then it shall be thoroughly cleaned before use.

Other light sources and cabinets which may be used if otherwise specified or agreed are described in [Annex A](#).

1) To be published.

6 Sampling

Take a representative sample of the product to be tested (or of each product in the case of a multi-coat system), as described in ISO 15528.

Examine and prepare each sample for testing, as described in ISO 1513.

7 Test panels

7.1 Material and dimensions

The test panels shall be of burnished steel complying with ISO 1514, and of minimum dimensions 150 mm × 70 mm × 0,3 mm.

7.2 Preparation and coating of panels

Prepare each test panel in accordance with ISO 1514 and then coat it by the specified method with the product or system under test.

The back and edges of the panel shall be coated with the product or system under test.

If the coating on the back and edges of the panel differs from that of the product under test, it shall have a corrosion resistance greater than that of the product under test.

7.3 Drying and conditioning

Dry (or stove) and age (if applicable) each coated test panel for the specified time under the specified conditions, and then condition them at a temperature and relative humidity as defined in ISO 3270 for at least 16 h with free circulation of air and without exposing them to direct sunlight. The test procedure shall then be carried out as soon as possible.

7.4 Thickness of coating

Determine the thickness, in micrometres, of the dried coating by one of the non-destructive procedures described in ISO 2808.

7.5 Scribing of panels

If specified, make a straight scribe through the coating to the substrate as described in ISO 11997-1:2005, 8.5, and ISO 17872.

8 Procedure

8.1 Carry out the determination in triplicate.

8.2 Expose at least one control specimen of similar composition and known durability with every test.

It is recommended that two control specimens, one of lower and one of higher durability, be included with each series of test panels.

8.3 Set up the cabinets as described in [Clause 5](#) and allow equilibrium to be established. Always start the exposure in the artificial weathering cabinet.

8.4 Arrange the panels in the artificial weathering cabinet ([5.1](#)) and expose for 168 h.

8.5 Transfer the panels to the cyclic corrosion test cabinet ([5.2](#)) and expose for 168 h. One test cycle shall consist of 60 min salt fog at ambient temperature and 60 min dry at $(35 \pm 2) ^\circ\text{C}$, unless otherwise