

# INTERNATIONAL STANDARD

**ISO**  
**2812-1**

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## **Paints and varnishes — Determination of resistance to liquids —**

### **Part 1:** General methods

*Peintures et vernis — Détermination de la résistance aux liquides —  
Partie 1: Méthodes générales*



Reference number  
ISO 2812-1:1993(E)

## ISO 2812-1:1993(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.

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.

International Standard ISO 2812-1 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Sub-Committee SC 9, *General test methods for paints and varnishes*.

ISO 2812 consists of the following parts, under the general title *Paints and varnishes — Determination of resistance to liquids*:

- Part 1: *General methods*
- Part 2: *Water immersion method*

This part of ISO 2812 cancels and replaces ISO 2812:1974, of which it constitutes an editorial and minor technical revision.

Annex A forms an integral part of this part of ISO 2812.

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# Paints and varnishes — Determination of resistance to liquids —

## Part 1: General methods

### 1 Scope

**1.1** This part of ISO 2812 is one of a series of standards dealing with the sampling and testing of paints, varnishes and related products.

It specifies general methods for determining the resistance of a single-coat film or a multi-coat system of paints or related products to the action of liquids.

Three methods of test are specified. The method to be used depends on the particular requirements of the test material. Method 1 is intended for more resistant coatings requiring longer periods of exposure than those which may be tested by method 2 or method 3.

**1.2** The methods enable the effect of the test liquid on the coating and, where necessary, deterioration of the substrate, to be assessed.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 2812. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 2812 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

1) To be published. (Revision of ISO 1514:1984)

ISO 1512:1991, *Paints and varnishes — Sampling of products in liquid or paste form.*

ISO 1513:1992, *Paints and varnishes — Examination and preparation of samples for testing.*

ISO 1514:—<sup>1)</sup>, *Paints and varnishes — Standard panels for testing.*

ISO 2808:1991, *Paints and varnishes — Determination of film thickness.*

ISO 4628-2:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 2: Designation of degree of blistering.*

### 3 Principle

A coated test panel is exposed to a liquid by one of three specified methods, as appropriate, 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 methods specified in this part of ISO 2812 need to be completed by supplementary information. The items of supplementary information are given in annex A.

**ISO 2812-1:1993(E)****5 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 1512.

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

**6 Test pieces****6.1 Materials and dimensions****6.1.1 Panels**

Unless otherwise specified or agreed, the test panels shall be of steel, tinplate, aluminium or glass complying with ISO 1514, and of approximate dimensions 150 mm × 100 mm × (0,75 to 1,25) mm.

**6.1.2 Rods (for method 1 only)**

One end of each rod shall be rounded to approximately the radius of the rod itself. Unless otherwise specified, the rod shall be of steel.

**NOTES**

1 Suitable dimensions for the rods are 150 mm long × 15 mm in diameter.

2 The use of rods for method 1 is to eliminate edge effects.

**6.2 Preparation and coating****6.2.1 Test panels**

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

**NOTE 3** For method 1, it is normally preferable to paint both faces of the panel and to protect the edges. It will be necessary to specify whether the back of the panel is to be coated with a suitable protective paint or whether both sides of the panel are to be coated with the product or system under test.

If specified, seal the edges of the test panel by suitable means, after coating with the product or system under test.

**6.2.2 Rods**

Prepare each rod as specified and then coat it by the specified method with the product or system under test.

**6.3 Drying**

Dry (or stove) and age (if applicable) each coated test piece for the specified time and, unless otherwise specified, condition them at a temperature of  $(23 \pm 2) ^\circ\text{C}$  and a relative humidity of  $(50 \pm 5) \%$  for at least 16 h. The appropriate test procedure shall then be carried out as soon as possible.

**6.4 Thickness of coating**

Determine the thickness, in micrometres, of the dried coating by one of the procedures specified in ISO 2808.

**7 Method 1 (immersion method)****7.1 Materials required****7.1.1 Test liquid, as specified.****7.2 Temperature of test**

Carry out the test at a temperature of  $(23 \pm 2) ^\circ\text{C}$ , unless otherwise agreed.

**7.3 Precautions to be taken**

It is preferable to immerse the test pieces individually in the test liquid, particularly when using liquids of high electrical conductivity in which electrolytic effects could be of some importance. If immersion of several test pieces in a single tank is more convenient, the nature of the test pieces shall be identical and every precaution shall be taken to ensure that the test liquid is unaffected by the test pieces.

The test pieces shall be at least 30 mm from the sides of the tank and, if several pieces are immersed in the same tank, they shall be at least 30 mm apart. The test pieces shall be electrically insulated from their supports.

**7.4 Procedure A (using a single-phase liquid)**

Carry out the procedure in triplicate, unless otherwise agreed.

**7.4.1** Place a sufficient amount of the test liquid (7.1.1) in a suitable vessel to immerse completely or partially the test piece (rod or panel) as specified. Keep the test piece in an approximately vertical position using suitable supports if necessary.

**7.4.2** Cover the container for the duration of the test to minimize loss of liquid by evaporation or splashing.

**7.4.3** If specified, aerate, agitate or circulate the test liquid. Carry out aeration by means of a slow stream of air free from oil and grease. If specified, make good any liquid losses by the addition of test liquid or distilled water at suitable intervals in order to maintain the original volume or concentration.

**7.4.4** At the end of the specified immersion period, wash the test piece thoroughly in running water if an aqueous test solution has been used, or with a solvent known to be non-injurious to the coating if a non-aqueous test liquid has been used. Remove any residual liquid from the surface by dabbing with a suitable absorbent paper or cloth, and examine the test piece immediately for blistering, in accordance with ISO 4628-2, or other signs of deterioration of the coating, if necessary comparing with an identically prepared, but un-immersed, test piece. Ignore any deterioration due to edge effects. Repeat the examination and comparison after a recovery period, if so specified.

**7.4.5** If it is required to examine the substrate for signs of attack, remove the coating by the specified method.

## **7.5 Procedure B (using a two-phase liquid)**

Carry out the procedure in triplicate, unless otherwise agreed.

**7.5.1** Insert the coated test piece into a suitable vessel so that it rests on suitable supports in an approximately vertical position and, in the case of panels, with the 100-mm side horizontal.

**7.5.2** Prepare each of the test liquids by saturating it with the other liquid immediately before use.

**7.5.3** Carefully pour the liquid of higher density down the side of the vessel until the test piece (rod or panel) is immersed to a depth of 75 mm, unless otherwise specified. Take care not to contaminate the test piece above this level.

**7.5.4** Add the second liquid in the same manner until the test piece is immersed to a further depth of 75 mm, unless otherwise specified. Cover the vessel and allow to stand, without agitation.

**7.5.5** At the end of the specified immersion period, remove the test piece from the test liquid, remove any test liquid from the surface by dabbing with a suitable absorbent paper or cloth, and examine the test piece immediately for blistering, in accordance with ISO 4628-2, or other signs of deterioration of the coating in contact with each liquid phase, comparing it if necessary with an identically prepared, but un-immersed, test piece. Ignore any deterioration due to edge effects. Repeat the examination and comparison after a recovery period if so specified.

If an intermediate examination is specified, remove the test piece from the test liquid, remove any test liquid from the surface, examine the test piece as above and then repeat the whole immersion procedure (7.5.1 to 7.5.4).

**7.5.6** If it is required to examine the substrate for signs of attack, remove the coating by the specified method.

## **8 Method 2 (using an absorbent medium)**

### **8.1 Materials required**

**8.1.1 Discs of absorbent material**, not affected by the test liquid, approximately 25 mm in diameter.

NOTE 4 For most purposes, compressed paper-board 1,25 mm thick will be suitable.

**8.1.2 Test liquid**, as specified.

**8.1.3 Watch-glasses**, approximately 40 mm in diameter and of such curvature that they do not touch the discs (see 8.3).

### **8.2 Temperature of test**

Carry out the test at a temperature of  $(23 \pm 2) ^\circ\text{C}$ , unless otherwise agreed.

### **8.3 Procedure**

Carry out the procedure in triplicate, unless otherwise agreed.

**8.3.1** Place the test panel in a horizontal position. Dip the appropriate number of absorbent discs (8.1.1) in the test liquid (8.1.2) and allow the excess liquid to drain. Place the discs on the test panel, ensuring that they are evenly distributed and at least 12 mm from the edge of the panel. Cover the discs individually with watch-glasses (8.1.3). Note by a suitable method the position of each disc. Leave the panel undisturbed in an atmosphere free from draughts for the period of test, which shall not exceed 7 days. In the case of volatile liquids, it may be necessary to replace the discs with further saturated ones and this shall be recorded in the test report.

**8.3.2** After the specified period, remove the discs and wash the panel thoroughly in running water if an aqueous test solution has been used, or with a solvent known to be non-injurious to the coating if a non-aqueous test liquid has been used. Remove any residual liquid from the surface by dabbing with a suitable absorbent paper or cloth, and examine the panel immediately for blistering, in accordance with ISO 4628-2, or other signs of deterioration of the coating. Repeat the examination and comparison after a recovery period, if so specified.

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**8.3.3** If it is required to examine the substrate for signs of attack, remove the coating by the specified method.

**9 Method 3 (spotting method)****9.1 Materials required**

**9.1.1 Test liquid**, as specified.

**9.2 Temperature of test**

Carry out the test at a temperature of  $(23 \pm 2) ^\circ\text{C}$ , unless otherwise agreed.

**9.3 Procedure**

Carry out the procedure in triplicate, unless otherwise agreed.

**9.3.1** Place the test panel in a horizontal position and apply to the coating an appropriate number of drops of the test liquid (9.1.1), each approximately 0,1 ml in volume. Ensure that the centres of the drops are at least 20 mm apart and at least 12 mm from the edge of the panel.

**9.3.2** Leave the panel undisturbed for the specified time, allowing air free access to it. If specified, a suitable means of covering the test area shall be used to prevent excessive evaporation.

**9.3.3** At the end of the specified period, wash the panel thoroughly in running water if an aqueous test liquid has been used, or with a solvent known to be non-injurious to the coating if a non-aqueous liquid has

been used, and immediately examine the panel for any signs of deterioration of the coating.

**9.3.4** If it is required to examine the substrate for signs of attack, remove the coating by the specified method.

**10 Precision**

Precision data are irrelevant for this part of ISO 2812 (see clause 3).

**11 Test report**

The test report shall contain at least the following information:

- a) all details necessary to identify the coating tested;
- b) a reference to this part of ISO 2812 (ISO 2812-1);
- c) the items of supplementary information referred to in annex A;
- d) a reference to the international or national standard, product specification or other document supplying the information referred to in c);
- e) any deviation from the test procedure specified, including, if method 2 was used, whether the discs were replaced;
- f) the result of the test in terms of the stated requirements;
- g) the date of the test.

## **Annex A**

(normative)

### **Required supplementary information**

The items of supplementary information listed in this annex shall be supplied as appropriate to enable the method to be carried out.

The information required should preferably be agreed between the interested parties and may be derived, in part or totally, from an international or national standard or other document related to the product under test.

- a) Nature of the substrate (see 6.1).
- b) Method of application of the test coating to the substrate and details of edge sealing of test panels and protection of the back surface (if applicable) (see 6.2.1 and 6.2.2).
- c) Duration and conditions of drying (or stoving) and ageing (if applicable) the coat (see 6.3).
- d) Thickness, in micrometres, of the dry coating and method of measurement in accordance with ISO 2808, and whether it is a single coating or a multi-coat system (see 6.4).
- e) Full details of the immersion liquid or liquids to be used for the test (see 7.1.1, 8.1.2 and 9.1.1).
- f) The method of test to be used (see 1.1) together with full details such as duration of test and the test temperature [if this is different from the normal ( $23 \pm 2$ ) °C]. If method 1 is to be used, the information supplied shall include depth of immersion, whether rods or panels are to be used, any aeration, agitation or circulation required, and whether the original volume or concentration is to be maintained. If method 2 is to be used, the information supplied shall include details of the compressed paper-board and whether replacement of the discs is necessary. If method 3 is to be used, the information shall include whether or not the test area is to be covered (see clauses 7 to 9).
- g) When and how inspection of the test coating is to be carried out, including details of recovery period, if applicable, and, where required, the method of removing the coating from the substrate (see clauses 7 to 9).
- h) The characteristics of the test coating and substrate that are to be considered in evaluating the resistance properties of the coating (see 1.1 and 1.2).

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