INTERNATIONAL STANDARD

ISO 2812-2

Second edition
2007-01-15

Paints and varnishes — Determination of resistance to liquids —

Part 2: Water immersion method

Peintures et vernis — Détermination de la résistance aux liquides —

Partie 2: Méthode par immersion dans l'eau

Reference number
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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.

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 2812-2 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 2812-2:1993), which has been technically revised. The main changes are:

— conditioning of the coated test pieces after drying (or stoving) and ageing was deleted;

— the purity of water was changed from grade 2 to grade 3;

— the standard has been editorially revised to align with the new ISO 2812 series.

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

— *Part 1: Immersion in liquids other than water*

— *Part 2: Water immersion method*

— *Part 3: Method using an absorbent medium*

— *Part 4: Spotting methods*

— *Part 5: Temperature-gradient oven method*

Paints and varnishes — Determination of resistance to liquids —

Part 2: Water immersion method

1 Scope

This part of ISO 2812 specifies a method for determining the resistance of an individual-layer or multi-layer system of coating materials to the effects of water by partial or full immersion.

This method enables the determination of the effects of water on the coating and, if necessary, the assessment of the damage to the substrate.

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

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

ISO 15711, *Paints and varnishes — Determination of resistance to cathodic disbonding of coatings exposed to sea water*

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 immersed in water and the effects of immersion are evaluated by criteria agreed in advance between the interested parties, these criteria usually being of a subjective nature.

4 Apparatus

All parts of the apparatus in contact with water shall be made from inert materials.

Ordinary laboratory equipment and the following apparatus:

4.1 Tank, of suitable size, fitted with a cover, a heater and thermostatic control. A convenient size of tank is 700 mm × 400 mm × 400 mm.

4.2 System for circulation and aeration of water, or a means for stirring, used in conjunction with a source of dry, oil-free, pressurized air. If a pump is used, it shall be of a suitable capacity to agitate the whole contents of the tank.

4.3 Support for the test panels, made from material that is electrically non-conducting, and arranged so that the panels are maintained at an angle of 15° to 20° to the vertical, with the test surface uppermost, and with their plane parallel to the direction of flow of water in the tank. The panels shall be at least 30 mm apart, situated at least 30 mm from the bottom of the tank and at least 30 mm from the walls of the tank. Their positions shall be changed periodically, either mechanically or by hand.

5 Sampling

Take a representative sample of the coating material to be tested, in accordance with ISO 15528.

Pretest each sample in accordance with ISO 1513 and prepare it for further testing.

6 Test panels

6.1 Materials and dimensions

Unless otherwise specified or agreed, the test panels shall be of burnished steel complying with ISO 1514, and of approximate dimensions 150 mm × 100 mm and a thickness of 0,7 mm to 1,0 mm.

6.2 Preparation and coating

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

Both sides should preferably be coated and the edges protected. It should be agreed whether the reverse side of the panel will be protected with a sufficiently resistant coating, or whether both sides of the panel will be coated with the coating material under test.

6.3 Drying and conditioning

Dry (or stove) and age (if applicable) each coated test panel for the specified time under the specified conditions. The test procedure shall be carried out as soon as possible.

6.4 Artificial damaging

If agreed between the interested parties, apply a scribe to the coating, as specified in ISO 17872, or an artificial holiday, as specified in ISO 15711.

6.5 Coating thickness

Determine the dry film thickness of the coating, in micrometres, using one of the non-destructive methods specified in ISO 2808.

7 Procedure

7.1 Number of determinations

Carry out the test in duplicate, unless otherwise agreed.

7.2 Determination

Add sufficient water (see the following paragraph) to the tank (4.1) such that the test panels, when positioned on the support (4.3), are immersed for three-quarters of their length. If specified, commence the circulation and aeration of the water (4.2) in the tank. Unless otherwise agreed, adjust the temperature of water to (40 ± 1) °C and maintain this temperature throughout the test.

Water conforming to the requirements of grade 3 of ISO 3696 should be used. Depending upon the end use of the coating, other grades of water may be used, for example natural or artificial seawater.

Test pieces can either be partially or fully immersed. If partial immersion is required, the test pieces should be immersed for three-quarters of their length. If full immersion is required, the test pieces should be immersed such that the water level is a minimum of 50 mm above the top of the test piece to avoid waterline oxygen concentration difference effects.

Place the test panels in the tank for the specified period, rearranging them at regular intervals of not more than 3 days. If water of grade 3 of ISO 3696 is used, replace the test water if at any time during the test it becomes turbid or coloured or its conductivity exceeds 2 mS/m, or if the oxygen content falls below 5 mg/l.

8 Evaluation

8.1 Interim inspections

For interim inspections during the test period, if specified, remove each panel from the tank at the appropriate time(s) and dry the panels by blotting with absorbent paper.

Within 1 min of drying, examine the panels for blistering in accordance with ISO 4628-2, or other signs of deterioration, and immediately return them to the tank.

8.2 Final inspection

At the end of the specified test period, remove each panel from the tank and dry the panels by blotting with absorbent paper. Within 1 min of drying, examine the whole test surface of each panel for blistering as described in ISO 4628-2, or for other signs of deterioration of the coating. Assessment of the change of adhesion may also be carried out at this stage.

Allow the panels to stay at room temperature for 24 h and examine the test surface again for loss of adhesion, rust staining, change of colour, embrittlement or other characteristics which may be specified.

If specified, carefully remove a 150 mm × 50 mm strip from the test surface with a non-corrosive paint remover and examine the exposed metal for signs of corrosion. For reference purposes, protect the exposed area by a suitable transparent lacquer.

If the results of the evaluation of the duplicate determinations for blistering or other signs of deterioration differ significantly, repeat the determination, again in duplicate.

Report the results of all determinations, including any repeat determinations.

9 Precision

No details are currently available for the repeatability limit (r) and reproducibility limit (R).

10 Test report

The test report shall contain at least the following information:

a) all information necessary for identification of the coating examined, including the manufacturer, trade name, batch number, etc.);

b) a reference to this International Standard (ISO 2812-2:2006);

c) details of the test panels, including:

   1) the material (including thickness) and surface pretreatment of the substrate;

   2) the application method for applying the sample coating to the substrate, including the drying time and drying conditions for all layers; where applicable, ageing conditions before the test;

   3) the dry film thickness of the coating, in micrometres, including the measuring method chosen in ISO 2808;

d) details of the method used, including:

   1) the duration of the test;

   2) whether the test piece was fully or partially immersed and, if partially, the immersion depth;

   3) the temperature of the water;

   4) the time between judgements and the removal of the panel from the water;

e) the result of test as specified in Clause 8, including any difference observed between the immersed and non-immersed portions of the test surface;

f) the name of the person who conducted the test;

g) any deviations from the procedure specified;

h) any unusual features (anomalies) observed during the test;

i) the date of the test.