INTERNATIONAL STANDARD

ISO 2812-3

Second edition
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Paints and varnishes — Determination of resistance to liquids —

Part 3: Method using an absorbent medium

Peintures et vernis — Détermination de la résistance aux liquides —

Partie 3: Méthode utilisant un milieu absorbant

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 2812-3 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 2812-3:2007), which has been technically revised. The main changes are the following:

— the use of filter paper with a diameter of 36 mm is now permitted (see 4.4);

— depth filter sheets and laboratory filter paper have been included as examples of suitable types of filter paper.

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 3: Method using an absorbent medium

1 Scope

This part of ISO 2812 specifies a method, using an absorbent medium, for determining the resistance of an individual-layer or multi-layer system of coating materials to the effects of liquids or paste-like products.

This method enables the tester to determine the effects of the test substance on the coating and, if necessary, to assess 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 test samples*

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

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

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

3 Principle

A coated test panel is exposed to one or more test substances by using an absorbent medium. The effects of the exposure are assessed in accordance with agreed criteria.

4 Apparatus and materials

Ordinary laboratory equipment and the following:

4.1 Heating cabinet, with artificial ventilation, for carrying out the test at temperatures up to 40 °C and capable of maintaining the temperature to within ±3 °C.

WARNING — To protect against explosion or fire, products containing volatile flammable substances should be handled with care. National regulations should be followed.

4.2 Watch glasses, with a diameter of approximately 40 mm, curved in such a way that, when placed over a test area (see 8.3), the watch glass will not touch the filter paper or cotton wool swab, impregnated with the test liquid, on the test area.

4.3 Petri dishes, with 60 mm diameter and 20 mm rim.

4.4 Filter paper, of a type that will not be affected by the test substance used, with a diameter of approximately 25 mm or 36 mm.

NOTE 1 So-called depth filter sheets (e.g. those used for polishing automotive paint coatings in laboratory testing) have been found suitable for this test. These sheets consist of a cellulose matrix containing a mixture of very fine kieselguhr and perlite particles as the filtration-active substances.

NOTE 2 For most purposes, laboratory filter paper with a thickness of 1,0 mm to 1,25 mm will be suitable.

4.5 Cotton wool, lint-free and of a type that will not be affected by the test substance used. Cotton wool may be used instead of filter paper (4.4) for the test and for cleaning the test panel at the end of the test period (see Clause 9).

5 Test substances

One or more test substances, as agreed between interested parties, shall be used. Examples of test substances are given in Annex A.

6 Sampling

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

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

7 Test panels

7.1 Substrate

Unless otherwise agreed, use test panels conforming to the requirements of ISO 1514, with dimensions of approximately 150 mm × 100 mm and a thickness of 0,7 mm to 1,0 mm.

7.2 Preparation and coating

Prepare each test panel as described in ISO 1514 and then coat it by the agreed method with the product or system under test. Dry (or stove) and age (if applicable) each coated test panel for the specified time under the specified conditions.

7.3 Coating thickness

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

8 Procedure

8.1 Conditioning of the test panels

Immediately before testing, condition the test panels for at least 16 h under standard conditions as specified in ISO 3270, i.e. (23 ± 2) °C and (50 ± 5) % relative humidity.

8.2 Test conditions

Unless otherwise specified, carry out the test at the standard temperature specified in ISO 3270, i.e. (23 ± 2) °C.

8.3 Determination

Perform the test in duplicate.

Place the test panel horizontally. When using liquid test substances, dip a filter paper or cotton wool swab into one of the test liquids and wait until the filter paper or cotton wool is thoroughly impregnated with the liquid. Take the filter paper or cotton wool swab out of the liquid and let excess liquid run off. Do not compress the filter paper or cotton wool to remove excess liquid. Place the filter paper or cotton wool swab on the test panel.

Repeat this procedure for each test liquid, making sure that the filter papers or cotton wool swabs do not touch one another and that the distance between the filter papers or cotton wool swabs and the edges of the panel is at least 10 mm. Then immediately cover the test areas with watch glasses or Petri dishes.

When using highly viscous or paste-like test substances, apply about 0,5 cm^3 of each substance to the test panel, place a filter paper or cotton wool swab over the substance and cover the test areas with Petri dishes.

The test duration shall be agreed between the interested parties and should reflect the end use of the coating.

When the test is performed at elevated temperatures, apply the agreed test substances and place the test panel in a heating cabinet for the agreed test period.

9 Evaluation

At the end of the test period, remove the filter papers or cotton wool swabs and wipe the test panel with dry cotton wool. Clean off any dried residue of aqueous test substances under running water, and clean off any dried residue of other test substances with a solvent that does not attack the coating.

Immediately assess the test panel for blistering, as specified in ISO 4628-2, relative to the non-exposed areas of the panel. Evaluate only the areas which have been in direct contact with a test substance. Rate any visible changes as specified in ISO 4628-1.

Unless otherwise agreed, reassess the exposed areas after 24 h.

Further tests on the exposed and non-exposed areas of the test panel may be performed (e.g. a cross-cut test or hardness test) to determine the changes resulting from the effects of the test substances.

If the substrate, i.e. the surface of the test panel, is to be examined for visible changes, remove the coating in conformity with the specified procedure.

If the results of the evaluation of the duplicate determinations differ significantly, repeat the test, again in duplicate.

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

10 Precision

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

11 Test report

The test report shall contain at least the following information:

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

b) a reference to this part of ISO 2812 (ISO 2812-3:2012);

c) details of the test panels, including:

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

   2) the method used to coat the substrate with the sample under test, including the drying time and drying conditions for all layers and, where applicable, the conditions of any ageing carried out before the test,

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

d) details of the method used, including:

1) the test substances used,

2) the duration of the test,

3) the temperature;

e) the result(s) of the test as specified in Clause 9;

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.

Annex A
(informative)

Examples of test substances

A.1 General

A range of fuels and chemicals that are typically used as test substances for automotive coatings is given in Clauses A.2, A.3 and A.4. Other test liquids may be used for testing both automotive and other coatings.

Use only analytical-grade chemicals.

A.2 Fuels and other fluids used in the automotive industry

A.2.1 **FAM test fluid**, conforming to the requirements of DIN 51604-1, DIN 51604-2 or DIN 51604-3.

A.2.2 **Diesel fuel**, conforming to the requirements of EN 590.

A.2.3 **Premium gasoline**, conforming to the requirements of EN 228.

A.2.4 **Bio-diesel**, conforming to the requirements of EN 14214.

A.2.5 **Engine oil**.

A.2.6 **Hypoid gear oil**.

A.2.7 **Hydraulic oil**.

A.2.8 **Automatic-transmission oil**.

A.2.9 **Brake fluid**.

A.2.10 **Radiator anti-freeze**.

A.2.11 **Body-sealing compound**.

A.2.12 **Cavity-sealing compound**.

A.2.13 **Windscreen-washer fluid**.

A.2.14 **Cold cleaner**.

A.3 Laboratory chemicals

A.3.1 **Ethanol**.

A.3.2 **Isopropanol**.

A.3.3 **Sodium hydroxide solution**, with a mass fraction of 5 % sodium hydroxide.

A.3.4 **Hydrochloric acid solution**, with a mass fraction of 10 % hydrochloric acid.

A.3.5 **Sulfurous acid solution**, with a mass fraction of 6 % sulfurous acid.

A.3.6 **Sulfuric acid solution**, with a mass fraction of 10 % sulfuric acid.

A.3.7 **Sulfuric acid solution**, with a mass fraction of 36 % sulfuric acid.

A.3.8 **Water**, conforming to the requirements of grade 3, ISO 3696.

A.4 Biological substances

A.4.1 **Resin**, consisting of:

— rosin 50 % (mass fraction)

— pine oil 50 % (mass fraction)

A.4.2 **Simulated insect excretion**, consisting of:

— e.g. formic acid 47 % (mass fraction)

— tannic acid 24 % (mass fraction)

— albumin 5 % (mass fraction)

— honey 24 % (mass fraction)

A.4.3 **Gum arabic (acacia gum)**.

A.4.4 **Rosin**.

A.4.5 **Simulated bird droppings**: Pancreatin, diluted 1:1 with water of grade 3 as defined in ISO 3696.

Pancreatin may be ground in a mortar, if agreed between the interested parties. If the pancreatin is ground, this will need to be stated in the test report.

Bibliography

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

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

[3] EN 228, *Automotive fuels — Unleaded petrol — Requirements and test methods*

[4] EN 590, *Automotive fuels — Diesel — Requirements and test methods*

[5] EN 14214, *Automotive fuels — Fatty acid methyl esters (FAME) for diesel engines — Requirements and test methods*

[6] DIN 51604-1, *FAM testing fluid for polymer materials — Composition and requirements*

[7] DIN 51604-2, *Methanolic FAM testing fluid for polymer materials — Composition and requirements*

[8] DIN 51604-3, *Methanolic lower layer FAM testing fluid for polymer materials — Composition and requirements*

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