
**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*



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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 (see 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 (see 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.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 2812-3:2012), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- [Clause 3](#) for terms and definitions has been added;
- in [Annex A](#), the CAS numbers have been added to the reagents listed.

A list of all parts in the ISO 2812 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Paints and varnishes — Determination of resistance to liquids —

Part 3: Method using an absorbent medium

1 Scope

This document 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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4618, *Paints and varnishes — Terms and definitions*

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 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 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.

5 Apparatus and materials

Ordinary laboratory equipment and the following.

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

5.2 Watch glasses, with a diameter of approximately 40 mm, curved in such a way that, when placed over a test area (see 9.3), the watch glass will not touch the filter paper or cotton wool swab, impregnated with the test liquid, on the test area.

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

5.4 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.

5.5 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 (5.4) for the test and for cleaning the test panel at the end of the test period (see Clause 10).

6 Test substances

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

7 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.

8 Test panels

8.1 Substrate

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

8.2 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.

8.3 Coating thickness

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

9 Procedure

9.1 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.

9.2 Test conditions

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

9.3 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 cm³ 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.

10 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.

11 Precision

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

12 Test report

The test report shall contain at least the following information:

- a) all information necessary for identification of the sample tested;
- b) a reference to this document (i.e. ISO 2812-3);
- 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 10](#);
- 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 [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, CAS-No 64-17-5.

A.3.2 Isopropanol, CAS-No 67-63-0.

A.3.3 Sodium hydroxide solution, with a mass fraction of 5 % sodium hydroxide CAS-No 1310-73-2.

A.3.4 Hydrochloric acid solution, with a mass fraction of 10 % hydrochloric acid, CAS-No 7647-01-0.

A.3.5 Sulfurous acid solution, with a mass fraction of 6 % sulfurous acid, CAS-No 7782-99-2.

A.3.6 Sulfuric acid solution, with a mass fraction of 10 % sulfuric acid, CAS-No 7664-93-9.

A.3.7 Sulfuric acid solution, with a mass fraction of 36 % sulfuric acid, CAS-No 7664-93-9.

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

A.4 Biological substances

A.4.1 Resin, consisting of:

- rosin, CAS-No 8050-09-7, CAS-No 94114-23-5 50 % (mass fraction)
- pine oil, CAS-No 2228-95-7 50 % (mass fraction)

A.4.2 Simulated insect excretion, consisting of:

- e.g. formic acid, CAS-No 64-18-6 47 % (mass fraction)
- tannic acid, CAS-No 1401-55-4 24 % (mass fraction)
- albumin, CAS-No 9006-59-1 5 % (mass fraction)
- honey 24 % (mass fraction)

A.4.3 Gum arabic, e.g. acacia gum, CAS-No 9000-01-5.

A.4.4 Rosin, CAS-No 8050-09-7, CAS-No 94114-23-5.

A.4.5 Simulated bird droppings: pancreatin (CAS-No 8049-47-6), 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, *Liquid petroleum products — Fatty acid methyl esters (FAME) for use in diesel engines and heating applications — 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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