

INTERNATIONAL STANDARD

ISO 1514

Third edition
1993-12-01

Paints and varnishes — Standard panels for testing

iTeh STANDARD PREVIEW
Peintures et vernis — Panneaux normalisés pour essais
(standards.iteh.ai)

ISO 1514:1993

<https://standards.iteh.ai/catalog/standards/sist/c5547b99-154d-4fd7-b884-ed2d5e4558c4/iso-1514-1993>



Reference number
ISO 1514:1993(E)

Foreword

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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 1514 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Sub-Committee SC 9, *General test methods for paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 1514:1984), of which it constitutes a technical revision.

Annexes A and B of this International Standard are for information only.

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Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

This International Standard is one of a series of standards dealing with the sampling and testing of paints, varnishes and related products.

For many of the most widely used test methods, the type of panel used and the particular way in which it is prepared for use can affect the test results to a significant degree. Consequently, it is important to standardize as carefully as possible both the panels and the procedure used to prepare the panels before painting. It is equally desirable to reduce to a minimum the number of different "standard panels" required for use in a paint testing laboratory.

It is not possible to include in an International Standard all the types of panel and preparation needed for paint testing and, in selecting those described in this standard, a distinction has been drawn between three different situations.

The first situation arises when the paint, varnish or other product is being tested in relation to a particular industrial application. This testing is most conveniently carried out on a panel or substrate that corresponds closely regarding material, cleaning procedure and subsequent surface preparation such as grit-blasting or chemical pretreatment) to the actual industrial application involved. In such instances, the only guidance that need be given regarding the panel is to state

- a) that the interested parties should reach agreement beforehand on the details of the materials and procedures to be used in preparing the substrate; and
- b) that these should be stated in the test report.

The second situation arises when the test method requires, in order to be carried out, a specially prepared test panel specific to that test; for example, an optically plane panel may be required for a gloss measurement. In such instances, a detailed specification for both the panel and the preparation procedure should be given in the description of the test method concerned.

The third situation arises when neither of the above two situations applies. In such cases, the product needs to be tested on an agreed surface which is capable of good reproducibility. It is desirable to use a material that is generally available in standard quality and can be conveniently cleaned or otherwise prepared so as to provide a consistent surface. The fact that this may not necessarily be the type of surface on which the product will be applied in practice is of less significance.

This International Standard is concerned with the third situation. It lays down preparation procedures that are known to be reproducible and gives additional guidance in instances where there may still be doubt because of lack of international uniformity of procedure.

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Paints and varnishes — Standard panels for testing

1 Scope

1.1 This International Standard specifies several types of standard panel (see 1.2) and describes procedures for their preparation prior to painting. These standard panels are for use in general methods of test for paints, varnishes and related products.

1.2 The following types of standard panel are specified:

- a) steel panels, prepared by
 - solvent-cleaning,
 - cleaning using a water-borne cleaner,
 - abrasion (burnishing),
 - blast-cleaning (notes for guidance only);
- b) tinplate panels, prepared by
 - solvent-cleaning,
 - abrasion (burnishing);
- c) aluminium panels, prepared by
 - solvent-cleaning,
 - cleaning using a water-borne cleaner,
 - abrasion (burnishing),
 - acid-chromating;
- d) glass panels, prepared by
 - solvent-cleaning,
 - detergent-cleaning;
- e) hardboard panels;
- f) paper-faced plasterboard panels;

- g) fibre-reinforced cement panels.

NOTE 1 Panels made from other materials and by other preparation procedures may be used by agreement, when specified for the product under test.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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.

ISO 209-1:1989, *Wrought aluminium and aluminium alloys — Chemical composition and forms of products — Part 1: Chemical composition.*

ISO 468:1982, *Surface roughness — Parameters, their values and general rules for specifying requirements.*

ISO 818:1975, *Fibre building boards — Definition — Classification.*

ISO 1111-1:1983, *Single cold-reduced tinplate and single cold-reduced blackplate — Part 1: Electrolytic and hot-dipped tinplate sheet and blackplate sheet.*

ISO 2695:1976, *Fibre building boards — Hard and medium boards for general purposes — Quality specifications — Appearance, shape and dimensional tolerances.*

ISO 2696:1976, *Fibre building boards — Hard and medium boards for general purposes — Quality specifications — Water absorption and swelling in thickness.*

ISO 3574:1986, *Cold-reduced carbon steel sheet of commercial and drawing qualities.*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods.*

ISO 8336:1993, *Fibre-cement flat sheets.*

ISO 8490:1986, *Metallic materials — Sheet and strip — Modified Erichsen cupping test.*

3 Steel panels

3.1 Material

Steel panels intended for general testing (in contrast to those required for testing for particular applications and uses) shall be of rust-free, flattened mild steel in sheet or strip form, the thickness and other dimensions of the panel being as specified in the description of the test method or as otherwise agreed.

Unless otherwise agreed, the steel shall be a fully killed, cold-reduced type with a grain size not greater than 0,030 mm and an Erichsen cupping value equivalent to not less than 10 mm on a sheet thickness of 0,75 mm to 0,80 mm (see note 2). The panels shall show a minimum of surface roughness and discoloration and, as a guide, it is recommended that the surface roughness (as defined in ISO 468) of the steel as received should not exceed 1,2 μm .

NOTES

2 Type CR4 steel, complying with ISO 3574, is a suitable cold-reduced and fully killed steel. However, its grain size and Erichsen cupping value are not specified and the latter should preferably be determined as described in ISO 8490 (see annex A).

3 If blast-cleaned steel panels are required, hot-rolled mild steel should preferably be used. Guidance on blast-cleaning is given in annex B. (See also 3.5.)

3.2 Storage prior to preparation

Unless the panels are supplied wrapped in paper treated with a vapour-phase inhibitor, protect the panels adequately from rusting by storage in a neutral light mineral oil or hydrocarbon solvent free from additives.

NOTE 4 For example, they may be either immersed totally in oil or coated with oil and then wrapped individually in paper impregnated with it. Alternatively, the panels may be stored in a desiccator containing an active desiccant (for example silica gel).

3.3 Preparation by solvent-cleaning

Wipe the panel free from excess oil and wash it thoroughly with a suitable solvent to remove all traces of oil.

NOTE 5 Xylene or a mineral solvent is suitable for this purpose. Other solvents that evaporate more quickly may

also be used, provided that they are neither acidic nor alkaline and that toxicity hazards are avoided.

Ensure that any small fibres deposited by cleaning cloths are removed in the cleaning process and that cloths are changed to avoid redistribution of oily residues. Do not contaminate the cleaned panel. Allow the clean panel to dry either by evaporation of the solvent or by lightly wiping with a clean linen cloth. If necessary, warm the panel very slightly to remove any traces of condensed moisture.

If a large number of panels is being prepared, it is prudent to check every 20th panel for cleanliness. One suggested method of checking is to wipe the panel with a clean, white paper tissue; the cleaning process shall be considered satisfactory if there is no stain on the tissue. If the panel does not show a satisfactory result on so testing, repeat the entire cleaning process on all the panels.

If the paint coating cannot be applied immediately, store the clean panels in a desiccator containing an active desiccant until required.

3.4 Preparation using water-borne cleaners (spraying or dipping procedure)

Clean the panels with a commercially available alkaline water-borne cleaner. A spraying procedure is recommended but a dipping procedure may also be used. Adjust the concentration of the cleaner in accordance with the manufacturer's recommendations.

Cleaning by the spraying procedure requires the following four steps:

- clean each side of the panel for a period of 5 s to 30 s, with the cleaning solution heated to 70 °C to 80 °C, applying a spraying pressure of approximately 10^5 Pa;
- rinse each side of the panel with tap water, applying a spraying pressure of approximately 10^5 Pa;
- rinse each side of the panel with deionized water containing 2 ml of 25 % (*m/m*) ammonium hydroxide solution per litre;
- dry the panels at 60 °C to 80 °C in an oven.

3.5 Preparation by abrasion (burnishing)

Burnishing is a method of abrading the surface with abrasive paper to remove unevenness and surface contamination that cannot be removed by solvent-cleaning, both these defects being liable to influence the uniformity of test results. To ensure complete removal of surface contaminants, the original surface has to be removed completely, as determined by visual inspection. The amount of surface removed depends on the initial surface profile, but shall in any

case be not less than 0,7 μm , which may conveniently be determined by measuring the loss in mass of the panel. (A mass loss per unit area of 5 g/m^2 to 6 g/m^2 is approximately equal to a thickness decrease of 0,7 μm).

Before burnishing, clean each panel using the procedures described in 3.3.

Unless otherwise agreed, carry out the burnishing operation by dry rubbing using good-quality silicon carbide paper with an abrasive grain size corresponding to that known as 220 silicon carbide grit.¹⁾

NOTE 6 Subject to prior agreement, mineral solvent may be used as a lubricant in the burnishing operation.

Burnish the panels uniformly, either by hand or mechanically. If hand burnishing is used, a suitable sequence of operations is as follows:

- a) straight across the panel in a direction parallel to any one side;
- b) at right angles to the first direction until all signs of the original burnishing have been removed;
- c) with a circular motion of diameter approximately 80 mm to 100 mm until a pattern has been produced consisting only of circular burnishing marks superimposed one upon another.

If mechanical burnishing is used, operation c) shall be employed. The burnishing operation shall be considered complete when no sign is visible of the original surface or any undulations.

Clean the burnished panels thoroughly before use, as described in 3.3, to ensure that all loose grit, steel particles and other contaminants are removed. Do not contaminate the cleaned panel.

If the paint coating cannot be applied immediately, store the clean panels in a desiccator containing an active desiccant until required.

3.6 Preparation by blast-cleaning

Before blast-cleaning, clean the panel using the procedure described in 3.3.

NOTE 7 General guidance is given in annex B on the preparation of test panels by blast-cleaning. It is emphasized, however, that this preparation by blast-cleaning is not intended for cold-rolled steel panels that are specified in 3.1 for general testing purposes.

4 Tinplate panels

4.1 Material

The panel shall be bright-finish standard-grade tinplate complying with ISO 1111-1, of nominal thickness between 0,2 mm and 0,3 mm, temper number T 52 (coated equally with tin on both sides).

NOTE 8 When the tinplate panels prepared in accordance with this International Standard are subsequently used in a test method, it is important that the designation code for the tinplate used is recorded in the test report for the test method concerned.

4.2 Preparation by solvent-cleaning

It is not necessary for tinplate panels to be specially protected during storage in the same way as steel panels (see 3.2). Nevertheless, the surface of the panels may become contaminated with lubricants during processing. It is therefore recommended that the panels be cleaned before use by the procedure specified in 3.3 for steel panels.

NOTE 9 Although solvent-cleaning does not remove all of the organic post-plating treatment, the residue has been found not to have any significant effect on the precision of the test results.

4.3 Preparation by abrasion (burnishing)

Burnished tinplate panels are recommended if a test surface more uniform than that produced by solvent-cleaning is required. Carry out the cleaning operation as described for steel panels (see 3.5) except that it shall be done much more lightly to avoid embedding abrasive in the surface and to avoid the complete removal of the tin plating at any point. It is therefore recommended that a good-quality, fine silicon carbide paper be used — for example, one with an abrasive grain size corresponding to 320 silicon carbide grit.¹⁾

Continue the burnishing operation until the whole of the surface of the panel is covered by a pattern of circular burnishing marks superimposed one upon another and the original surface pattern is no longer visible to the naked eye.

Clean the burnished panels thoroughly before use, as described in 3.3, to ensure that all loose grit, tin particles and other contaminants are removed. Do not contaminate the cleaned panel.

If the paint coating cannot be applied immediately, store the clean panels in a desiccator containing an active desiccant until required.

1) According to information at present available, this is a grade of silicon carbide grit standardized through the Federation of European Producers of Abrasive Products (FEPA).

5 Aluminium panels

5.1 Material

Aluminium panels intended for general testing (in contrast to aluminium or aluminium alloy panels required for testing for particular applications and uses) shall be of sheet or strip complying with the chemical composition for grade Al 99,0 as defined in ISO 209-1:1989. Either soft (annealed) or hard material shall be used, as specified for the particular test method. The hard aluminium shall have a tensile strength of at least 150 MPa²⁾ and the soft aluminium a tensile strength not greater than 105 MPa. The thickness and other dimensions of the panel shall be as specified in the test method or as otherwise agreed. The sheet and strip shall show no cracks when a test piece of the metal, 20 mm wide and of convenient length, cut with the longer axis transverse to the direction of rolling and with the longer edges carefully rounded and smoothed longitudinally, is bent through 180° flat upon itself, in the case of soft aluminium, or through 180° on a cylindrical former of radius equal to the thickness of the sheet, in the case of hard aluminium.

5.2 Preparation by solvent-cleaning

If clean panels are required, without further preparation, use the cleaning procedure specified in 3.3 for steel panels.

5.3 Preparation using water-borne cleaners (spraying or dipping procedure)

If clean panels are required, without further preparation, use the cleaning procedure specified in 3.4 for steel panels, but in this case the cleaning solution shall be heated to 60 °C to 65 °C.

5.4 Preparation by abrasion (burnishing)

If burnished panels are required, the procedure shall be essentially as specified in 3.5 for steel panels, except that the abrasive shall be applied to a cloth pad and shall consist of calcined alumina powder complying with the following specifications:

particles greater than 63 µm: 10 % max.

particles less than 20 µm: 70 % min.

particles less than 10 µm: 60 % min.

The sequence of burnishing operations shall be as specified in 3.4, but the abrasive shall be wetted with a mineral solvent for paint, e.g. white spirit, and ap-

2) 1 MPa = 1 N/mm²

plied to the panel surface on a pad of soft cloth or other suitable material.

Continue the burnishing operation until the whole of the surface of the panel is covered by a pattern of circular burnishing marks superimposed one upon another and the original surface pattern is no longer visible to the naked eye.

Clean the burnished panels thoroughly before use, as described in 3.3, to ensure that all loose grit, aluminium particles and other contaminants are removed. Do not contaminate the cleaned panel.

Aluminium panels shall be prepared immediately prior to painting.

5.5 Preparation by acid-chromating

If aluminium panels are prepared by acid-chromating for general testing (in contrast to those required for testing for particular applications), it is recommended that the following procedure be used.

Prepare the acid chromate solution as follows:

Dissolve approximately 100 g of analytical-grade potassium or sodium dichromate in 1 000 ml of water of at least grade 3 purity as defined in ISO 3696 and add slowly, while stirring, 170 ml of analytical-grade sulfuric acid ($\rho \approx 1,84$ g/ml).

WARNING — Wear safety goggles and rubber gloves when preparing and using acid chromate solutions.

In use, keep the volume of the solution constant by the addition of grade 3 water.

Do not allow the chromic acid content of the solution to fall below 30 g/l. Regenerate the solution, if necessary, by adding appropriate quantities of sulfuric acid and potassium or sodium dichromate.

Discard the solution when solid material begins to separate out on cooling the solution to room temperature, or at the first signs of pitting of the aluminium panels, whichever occurs first.

Clean the panels as described in 5.2 and immerse them for 20 min at (55 ± 5) °C in the acid chromate solution contained in a glass or polyethylene vessel.

Remove the panels from the solution and wash them thoroughly and as rapidly as possible in cold and then in hot grade 3 water at a temperature of (60 ± 2) °C for between 30 s and 40 s. Allow the panels to dry either at room temperature or, preferably, in a well ventilated oven at (70 ± 2) °C and then coat them as soon as possible on the day of preparation with the paint. Do not contaminate the clean panel.

6 Glass panels

6.1 Material

The panels shall be of flat or polished float glass. The thickness and other dimensions of the panels shall be as specified in the test method or as otherwise agreed.

6.2 Preparation by solvent-cleaning

Clean the panels on the day of use by the procedure specified in 3.3 for steel panels.

6.3 Preparation by detergent-cleaning

Wash the panels thoroughly in a warm, aqueous solution of a non-ionic detergent and then rinse thoroughly with warm grade 3 water (as defined in ISO 3696).

Dry the cleaned panels by allowing the rinsing water to evaporate off. If necessary, warm the panel slightly to remove the last traces of moisture. Do not contaminate the cleaned panel.

7 Hardboard

7.1 Material

Fibre building boards, as classified in ISO 818, are sheet materials manufactured from ligno-cellulose fibres with primary bonding derived from the felting of the fibres and their inherent adhesive properties. The strength of these boards may be enhanced by the use of bonding materials or additives. Hardboard is classified as having a density greater than $0,80 \text{ g/cm}^3$. ISO 2695 is the quality specification concerned with the appearance, shape and dimensional tolerances of hardboard and ISO 2696 is the quality specification relating to the water-absorption and swelling properties of hardboard.

7.2 Preparation

Select hardboard complying with the requirements of ISO 2695 or ISO 2696 and cut the sheet to produce test panels of the required size. Wipe both sides and edges of each panel free from dust with a dry cloth and store at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity, with free access to air, for not less than 3 weeks. Do not contaminate the cleaned panel. Use the smooth surface for testing the paint or related product.

8 Paper-faced plasterboard

8.1 Material

Paper-faced plasterboard is a building board composed of a core of set gypsum plaster ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) enclosed between and bonded to two sheets of thick paper. The core may be solid or cellular gypsum and may contain a small proportion of fibre. The thickness of the board is approximately 10 mm. One paper face of the board is designed to be directly decorated without the initial application of a plaster coat or coats. This face shall be used for testing the paint or related product. When stored in direct sunlight, the paper facing may have a tendency to discolour or "bleed" when coated with certain types of paint.

8.2 Preparation

Cut the paper-faced plasterboard under dry conditions to produce test panels of the required size. Seal the edges of the test panel with suitable adhesive tape, wipe free from dust with a dry cloth and store in the absence of direct sunlight at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity, with free access to air, for not less than 3 weeks. Do not contaminate the cleaned panel. Wipe all panels free from dust immediately before use.

9 Fibre-reinforced cement panels

The material and preparation shall be in accordance with ISO 8336.

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