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Paints and varnishes — Standard panels for testing

Peintures et vernis — Panneaux normalisés pour essais

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

This fourth edition cancels and replaces the third edition (ISO 1514:1993), which has been technically revised.

Introduction

For many of the test methods most widely used for paints and varnishes, the type of panel used and the particular way in which it is prepared for use can effect the test results to a significant degree. Consequently, it is important to standardize as carefully as possible both the panels and the procedures used to prepare the panels prior to 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 panels 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 needs to 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 might be required for 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 might 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 might still be doubt because of lack of international uniformity of procedure.

Paints and varnishes — Standard panels for testing

WARNING — This International Standard prescribes the use of chemicals, including hexavalent chromium, and apparatus that can pose health and safety hazards. The standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety practices and to determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard specifies several types of standard panel 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.

The following types of standard panel are specified:

a) steel panels, prepared by
   - solvent cleaning,
   - aqueous cleaning,
   - abrasion,
   - phosphate treatment,
   - blast-cleaning (notes for guidance only);

b) tinplate panels, prepared by
   - solvent cleaning,
   - aqueous cleaning,
   - abrasion (burnishing);

c) zinc-coated panels, prepared by
   - solvent cleaning,
   - aqueous cleaning,
   - abrasion,
   - chemical treatment;

d) aluminium panels, prepared by
   - solvent cleaning,
   - aqueous cleaning,
   - abrasion (burnishing),
   - chromate conversion coating;

e) glass panels, prepared by

— solvent cleaning,

— detergent cleaning;

f) hardboard panels;

g) paper-faced plasterboard panels;

h) fibre-reinforced cement panels.

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

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

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

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

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

ISO 8336, *Fibre-cement flat sheets*

ISO 10546, *Chemical conversion coatings — Rinsed and non-rinsed chromate conversion coatings on aluminium and aluminium alloys*

ISO 11949, *Cold-reduced electrolytic tinplate*

3 Steel panels

3.1 Material

Steel panels intended for general testing (as opposed to panels intended for testing for particular applications and uses) shall be manufactured from flattened mild steel in sheet or strip form. The steel used shall be free from rust, scratches, staining, discoloration and other surface defects. The physical dimensions of the panel shall be as specified in the description of the test method, or as otherwise agreed. Unless otherwise agreed upon between the purchaser and the seller, the steel shall be of one of the types specified below. For certain types of testing, it might be necessary to use steel of a greater thickness than specified for the types listed below.

a) Type 1 steel is a commercial quality cold-reduced type with a sheet thickness of 0,60 mm to 1,00 mm. Type CR1 steel, conforming to the requirements of ISO 3574, is a suitable commercial quality cold-reduced steel. The steel shall have a matt finish, with a surface roughness (Ra) of 0,63 µm to 1,65 µm. This finish is typical of steel used for painted surfaces on automobiles and appliances.

b) Type 2 steel is a fully killed, cold-reduced type with a sheet thickness of 0,75 mm to 0,80 mm. Type CR4 steel, conforming to the requirements of ISO 3574, is a suitable fully killed cold-reduced steel. The panels shall show a minimum of surface roughness and discoloration. It is recommended that the surface roughness (Ra) of the steel, as received, does not exceed 1,2 µm.

c) Type 3 steel is a commercial quality cold-reduced type with a sheet thickness of 0,25 mm to 0,60 mm. The steel shall have a smooth finish, with a surface roughness (Ra) not higher than 0,51 µm. This finish is useful for measuring colour, gloss, flexibility or adhesion of coatings, where it is desirable to minimize the effects of variability in the surface finish.

NOTE Guidance on blast-cleaning is given in Annex A for use when blast-cleaned steel panels are required (see also 3.7).

3.2 Storage prior to preparation

Prior to preparation, panels shall be stored in a manner that protects them from corrosion. Suitable methods include wrapping the panels in paper treated with a vapour-phase inhibitor and storage in a neutral light mineral oil or hydrocarbon solvent free from additives.

NOTE For example, panels may be either totally immersed 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 (silica gel, for example).

3.3 Preparation by solvent cleaning

Wipe the panel to remove any excess oil, and then wash it thoroughly with a suitable solvent to remove all traces of oil.

NOTE Solvents which evaporate quickly may be used, provided that they are neither acidic nor alkaline and that toxicity hazards are avoided (see WARNING).

Ensure that any small fibres deposited by cleaning cloths are removed in the cleaning process, and that cloths are changed at predetermined intervals to avoid redeposition of oily residues. Do not contaminate the cleaned panels. Allowing the solvent to evaporate, lightly wiping the panels with a clean linen cloth and subjecting the panels to a stream of warm air are suitable methods of drying. If necessary, lightly warm the panels to remove any traces of condensed moisture.

If a large number of panels is prepared, it is prudent to check every 20th panel for cleanliness. The suggested method for checking the cleanliness is to wipe the panel with a clean, white paper tissue. The cleaning process shall be regarded as satisfactory if there is no pickup of soil on the tissue. If there is found to be residual soil on the panel being checked, it is necessary to repeat the cleaning process on all of the panels cleaned since the previous wipe test.

If it is not feasible to apply the paint coating immediately after cleaning, the cleaned panels shall be stored in a dry and clean atmosphere, such as a desiccator containing an active desiccant, until required for use. It is also acceptable practice to wrap the panels in paper treated with a vapour-phase inhibitor.

3.4 Preparation by aqueous cleaning (spray or immersion process)

Clean the panels with a commercially available aqueous alkaline cleaner. A spray cleaning process is recommended, but an immersion cleaning process is also acceptable. Maintain the cleaner concentration and temperature in accordance with the recommendations of the cleaner manufacturer.

Cleaning by a spray process requires the following four steps:

a) Clean each side of the panel for a period of not less than 10 s. Regulate the temperature and spray pressure in accordance with the recommendations of the cleaner manufacturer.

b) Rinse each side of the panel with tap water. Take steps to ensure that the rinse water does not become significantly contaminated during the cleaning process. This can be accomplished by allowing clean tap water to run into the rinse tank in such a way that the tank overflows continuously or periodically.

c) Rinse each side of the panel with deionized water having a conductivity of not greater than 20 µS/cm.

d) Immediately after rinsing, force-dry the panels in an oven or in a stream of hot air.

If a large number of panels is prepared, it is prudent to check the panels periodically for cleanliness. In addition to the white cloth wipe method specified in 3.3, a water break test should be used on panels prepared by aqueous cleaning. The surface of a cleaned panel should be water break free. This is determined by immersing the panel momentarily in distilled or deionized water. When the panel is removed, the water should form a continuous unbroken film on the surface of the panel, without beading up into discrete droplets or other water breaks.

3.5 Preparation by abrasion

3.5.1 General

Some testing applications require a more uniform and reproducible surface than is available on steel, as rolled by the mill. In such cases, it is necessary to remove surface variability and contamination through mechanical abrasion. To ensure complete removal of contamination and variability, it is necessary to completely remove the original mill surface. The amount of surface removal required will depend somewhat on the original surface profile, but it shall never be less than 0,7 µm, which may conveniently be determined by measuring the loss in mass of the abraded 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).

Prior to abrading, panels should be cleaned as described in 3.3 or 3.4. Unless otherwise agreed, the surface removal shall be accomplished as described in 3.5.2 to 3.5.4.

NOTE Subject to prior agreement, mineral solvent may be used as a lubricant in the abrasion operations.

3.5.2 Hand abrasion

This involves abrading the panel by hand using P220 silicone carbide paper. The following is a suitable sequence of operations for use in hand abrasion:

a) Abrade the panel uniformly straight across its face in a direction parallel to any one side.

b) Abrade the panel at a right angle to the initial direction until all signs of the original abrasion have been removed.

c) Abrade the panel using a circular motion, with a diameter of approximately 80 mm to 100 mm, until a pattern is produced consisting solely of circular abrasion marks, superimposed one upon another.

3.5.3 Circular mechanical abrasion

This involves burnishing the panel by mechanical means using P220 silicon carbide paper. When this method is employed, the panel shall be burnished using a circular motion, with a diameter of approximately 80 mm to 100 mm. The operation shall be considered complete when no sign is visible of the original surface or any undulations.

3.5.4 Linear grinding

This involves a conveyor system using an abrasive belt mounted on a vertical grinding head to remove the original mill surface and produce a linear scratch finish on the panel. Grinding the surface with abrasive belts removes contamination and provides a surface that is more uniform and reproducible than a typical mill finish.

A P100 aluminium oxide abrasive belt is suitable for use in this operation. The surface roughness (Ra) of the polished panel shall be between 0,50 µm and 1,14 µm.

3.5.5 Inspection and cleaning

Inspect the abraded panels to ensure that the original surface has been completely removed. Clean the panels thoroughly as described in 3.3 or 3.4 to remove any loose grit, steel particles or other contaminants. Do not contaminate the cleaned panels.

If it is not feasible to apply the subsequent coating immediately, store the clean panels in a clean and dry atmosphere, such as a desiccator containing an active desiccant, or wrap the panels in paper impregnated with a vapour-phase inhibitor.

3.6 Preparation by phosphate treatment

3.6.1 General

Phosphate conversion coatings are available from a number of sources, as proprietary compounds or processes, for application by spray or immersion. Follow the manufacturer's directions as to the application of the conversion coating. Preparation of test panels may consist of one or more steps of cleaning, rinsing and conditioning prior to the application of the conversion coating. Additional rinsing will usually be required after the conversion coating has been applied. If phosphate-treated panels are required, use one of the following methods of preparation.

3.6.2 Crystalline zinc phosphate treatment

This conversion coating method consists of reacting the steel surface in a zinc acid phosphate solution containing oxidizing agents and accelerating salts. The steel surface is converted to a crystalline phosphate coating that inhibits corrosion and increases the adherence and durability of subsequently applied paint films. This treatment can be applied by spraying, by immersion or by a soft-bristle nylon brush. Solution temperatures, concentrations and contact times will vary with the method of application and should be maintained in accordance with the chemical manufacturer's recommendations. Zinc phosphate coatings are typically grey to grey-white in colour.

3.6.3 Amorphous iron phosphate treatment

This conversion coating method consists of reacting the steel surface in an acid phosphate solution containing oxidizing agents and accelerating salts. The steel surface is converted to an amorphous iron phosphate coating that improves the adhesion of subsequently applied coatings and inhibits corrosion to a lesser degree than the crystalline zinc phosphate coating. This treatment can be applied by spraying or immersion. Solution temperatures, concentrations and contact times will vary with the method of application and should be maintained in accordance with the chemical manufacturer's recommendations. Iron phosphate coatings typically range in colour from yellow-blue to purple.

3.7 Preparation by blast-cleaning

Before blast-cleaning, clean the panels using the procedure described in 3.3 or 3.4.

General guidance on the preparation of steel panels by blast-cleaning is given in Annex A.

NOTE 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.