
INTERNATIONAL STANDARD



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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 institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, International Standard ISO 1514 replaces ISO Recommendation R 1514-1970 drawn up by Technical Committee ISO/TC 35, *Paints and varnishes*.

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The Member Bodies of the following countries approved the Recommendation:

Australia	Iran	South Africa, Rep. of
Austria	Ireland	Spain
Denmark	Israel	Sweden
Egypt, Arab Rep. of	Italy	Switzerland
France	Netherlands	Turkey
Germany	Peru	United Kingdom
Greece	Poland	U.S.S.R.
India	Portugal	

No Member Body expressed disapproval of the Recommendation.

Paints and varnishes — Standard panels for testing

0 INTRODUCTION

This International Standard is one of a series 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 affect the test results to a significant degree. Consequently, it is important to standardize as carefully as possible both the panels and the preparation procedure employed for these tests. 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 specified in this document, a distinction has been drawn between three different requirements, as follows :

The *first requirement* arises when the paint, varnish or other product is being tested in relation to a particular industrial application. This is most conveniently done 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;
- b) that these should be stated in the test report.

The *second requirement* arises when the test method requires for its performance a specially prepared test panel specific to that test; for example, an optically flat panel may be required for a gloss comparison test. 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 requirement* arises when neither of the above apply. 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 which is generally available in standard quality and which can be conveniently cleaned or

otherwise prepared so as to provide a standard 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 requirement. 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.

1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard specifies procedures for the preparation, prior to painting, of standard panels for use in *general* methods of test for paints, varnishes and related products.

1.2 The following types of standard panels are described :

- a) Steel panels prepared by
 - solvent cleaning,
 - abrasion (burnishing),
 - blast-cleaning (notes for guidance only).
- b) Tinplate panels prepared by
 - solvent cleaning,
 - abrasion (burnishing).
- c) Aluminium panels prepared by
 - solvent cleaning,
 - abrasion (burnishing),
 - acid chromating.
- d) Glass panels prepared by
 - solvent cleaning,
 - detergent cleaning.

2 REFERENCES

ISO/R 209, *Composition of wrought products of aluminium and aluminium alloys – Chemical composition (per cent)*.

ISO/R 468, *Surface roughness*.

ISO 1250, *Mineral solvents for paints – White spirits and related hydrocarbon solvents*.

3 STEEL PANELS

3.1 Material

Steel panels intended for *general* testing (in contrast to those required for testing to 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 otherwise agreed.

Unless otherwise agreed, the steel shall be a fully killed, cold-reduced type having 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 0,8 mm (see Annex A). The panels shall show a minimum of surface roughness and discoloration and, as a guide, it is recommended that the surface roughness of steel as received (as defined in ISO/R 468) should not exceed 1,5 μm .

3.2 Storage

The panels shall be adequately protected from rusting before use, by storage in a light neutral mineral oil or hydrocarbon solvent¹⁾; for example they may be totally immersed in or coated with this oil and then wrapped individually in paper impregnated with oil.

3.3 Preparation by solvent cleaning

Wipe the panel free from excess oil and wash it thoroughly with xylene or mineral solvent to remove all traces of oil; other solvents which evaporate more quickly may be used provided toxic hazards are avoided.

Various washing procedures are permitted provided they are neither acid nor alkaline. It is essential to ensure that any small fibres arising from cleaning cloths are removed in the cleaning process. The surface of the panel must not be touched by hand or otherwise contaminated after cleaning. Allow the clean panel to dry either by evaporation of the washing solvent or by lightly wiping with a clean linen cloth, if necessary warming very slightly to remove traces of condensed moisture. If the paint coating cannot be applied immediately, the clean panels shall be stored in a desiccator until required.

1) The oil or hydrocarbon solvent shall be free from additives.

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

Where a large number of panels is being prepared, it is prudent to check every 20th panel for cleanness. One suggested method of checking is to dip this one panel momentarily into pure distilled water. The cleaning process is considered satisfactory if the panel on withdrawal shows a nearly continuous film of distilled water on its surface. If the panel does not show a satisfactory result on the test, the entire cleaning process shall be repeated on all the panels. In any case, the panel tested must be recleaned before use.

3.4 Preparation by abrasion (burnishing)

The burnishing operation 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 shall be completely removed as determined by visual inspection. The amount of surface to be removed depends on the initial surface profile but in any case shall be not less than 0,7 μm , which may conveniently be determined by the loss in mass of the panel (a thickness of 0,7 μm is approximately equivalent to a mass of 5 to 6 g/m^2).

Unless otherwise agreed, the burnishing operation shall be carried out by dry rubbing using a good quality silicon carbide paper with an abrasive grain size corresponding to that known as 220 silicon carbide grit²⁾.

NOTE Subject to prior agreement, mineral solvent complying with ISO 1250 may be used as a lubricant in the burnishing operation.

The panels shall be burnished uniformly either by hand or mechanically, a suitable sequence of operations being 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 8 to 10 cm, until a pattern has been produced consisting only of circular burnishing marks superimposed one upon another.

Where mechanical burnishing is used, the operation c) above is essential. The burnishing operation is considered complete when no sign is visible of the original surface or its undulations.

The burnished panels shall be cleaned thoroughly before use, according to the procedure specified in 3.3, to ensure that all loose grit, steel particles and other contaminants are removed. Care shall be taken to ensure that the surface of the finally cleaned panel is not touched by hand or

otherwise contaminated. If the paint coating cannot be applied immediately, the cleaned panels shall be stored for a few days only in a desiccator until required.

3.5 Preparation by blast-cleaning

Where it is required to carry out tests on panels of blast-cleaned structural steel, the guidance given in Annex B shall be followed, unless otherwise agreed. It is emphasized, however, that this preparation by blast-cleaning is not intended for cold-rolled steel panels such as are specified in 3.1 for general testing purposes.

4 TINPLATE PANELS

4.1 Material

The panel shall be of tinplate made by the cold reduction process and coated with tin by a suitable process. The steel substance shall have a nominal thickness of 0,3 mm and the tin coating shall be equivalent to a mass of 24,0 g/m².

4.2 Preparation by solvent cleaning

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

4.3 Preparation by abrasion (burnishing)

Burnished tinplate panels are recommended where a more uniform test surface is required than is produced by solvent cleaning. The burnishing operation shall be carried out as for steel panels (see 3.4) except that it shall be done much more lightly to avoid embedding abrasive in the surface and completely removing the tin coating in some places. It is therefore recommended to use a good quality, fine silicon carbide paper, for example one with an abrasive grain size corresponding to 320 silicon carbide grit.

The burnishing operation shall be continued 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.

The burnished panels shall be cleaned thoroughly before use according to the procedure specified in 3.3, to ensure that all loose grit, tin particles and other contaminants are removed. Care shall be taken to ensure that the surface of the finally cleaned panel is not touched by hand or otherwise contaminated. If the paint coating cannot be applied immediately, the cleaned panels shall be stored for a few days only in a desiccator until required.

5 ALUMINIUM PANELS

5.1 Material

Aluminium panels intended for *general* testing (in contrast to aluminium, or aluminium alloy, panels required for testing to particular applications and uses) shall be of sheet or strip complying with the chemical composition for Grade Al 99,0 in ISO/R 209. 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 138 N/mm² and the soft aluminium a tensile strength not greater than 108 N/mm². The thickness and other dimensions of the panel shall be as specified in the test method or otherwise agreed. The sheet and strip shall not show any 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

Where clean panels are required without further preparation, the cleaning procedure used shall be that specified in 3.3 for steel panels.

5.3 Preparation by abrasion (burnishing)

Where burnished panels are required, the procedure shall be essentially as specified in 3.4 for steel panels, except that the abrasive used shall be calcined alumina conforming to the following specification :

particles greater than 63 μm :	10 % maximum
particles less than 20 μm :	70 % minimum
particles less than 10 μm :	60 % minimum

The sequence of burnishing operations shall be as specified in 3.4, but the abrasive shall be wetted with mineral solvent for paint (white spirit) and applied to the panel surface on a pad of soft cloth or other suitable material.

The burnishing operation shall be continued 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.

The burnished panels shall be cleaned thoroughly before use according to the procedure specified in 3.3, to ensure that all loose grit, aluminium particles and other contaminants are removed. Care shall be taken to ensure that the surface of the finally cleaned panel is not touched by hand or otherwise contaminated. Aluminium panels shall only be prepared immediately prior to painting because if stored an oxide film is liable to form on the surface.

5.4 Preparation by acid chromating

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

Clean the panels as specified in 5.2 and immerse them for 20 min at 55 ± 5 °C in an acid chromate solution contained in a glass or polyethylene vessel. The solution shall be prepared as follows :

Dissolve 100 g of analytical reagent quality potassium or sodium dichromate in 1 000 ml of distilled water and add slowly, while stirring, 170 ml of analytical reagent quality sulphuric acid (ρ 1,84 g/ml).

(SAFETY WARNING : When preparing and using acid chromate solutions, the operator shall wear safety goggles and rubber gloves.)

Remove the panels from the solution and wash them thoroughly and as rapidly as possible in cold and then in hot distilled water (or demineralized water of specific resistance of at least 10^5 ohm-cm). Allow the panels to dry and then coat them as soon as possible with the paint. Care shall be taken to ensure that the prepared surface is not touched by hand or otherwise contaminated before painting.

NOTE — The chromate solution will become exhausted with use and shall be renewed when necessary.

6 GLASS PANELS

6.1 Material

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

6.2 Preparation by solvent cleaning

The panels shall be cleaned by the procedure specified in 3.3 for steel panels.

6.3 Preparation by detergent cleaning

The panels shall be washed thoroughly in a warm, aqueous, non-ionic detergent solution and then rinsed thoroughly with warm distilled water (or demineralized water of specific resistance of at least 10^5 ohm-cm).

The cleaned panels shall be dried by evaporation of the final washing water and may be warmed to remove any traces of condensed moisture. Care shall be taken to ensure that the prepared surface is not touched by hand or otherwise contaminated before painting.

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ANNEX A

MILD STEEL FOR PANELS

In the absence of detailed International Standards for qualities of mild steel sheet, the specification in 3.1 is given as a guide to those wishing to select a suitable steel from national standard specifications, or to order test panels from a steel supplier.

The advantage of using a fully killed steel rather than a rimmed steel is that the former is likely to show a more homogeneous structure and composition throughout the sheet, whereas the latter is liable to have a much less uniform and reproducible surface.

The maximum grain size of the type of steel under discussion is closely related to the Erichsen cupping value and the latter test may therefore be used for control purposes without the need to measure the grain size. The minimum cupping value required depends on the thickness of the panel, as indicated in the figure.

The following data relate to one particular steel corresponding to the quality specified in 3.1 :

tensile strength :
275 N/mm² minimum

yield stress :
138 N/mm² minimum

elongation (on 50 mm gauge length) :
34 % minimum

elongation (on 200 mm gauge length) :
25 % minimum

bend test (180°) :
flat

Chemical composition :

carbon : 0,10 % maximum
manganese : 0,50 % maximum
sulphur : 0,040 % maximum
phosphorus : 0,040 % maximum

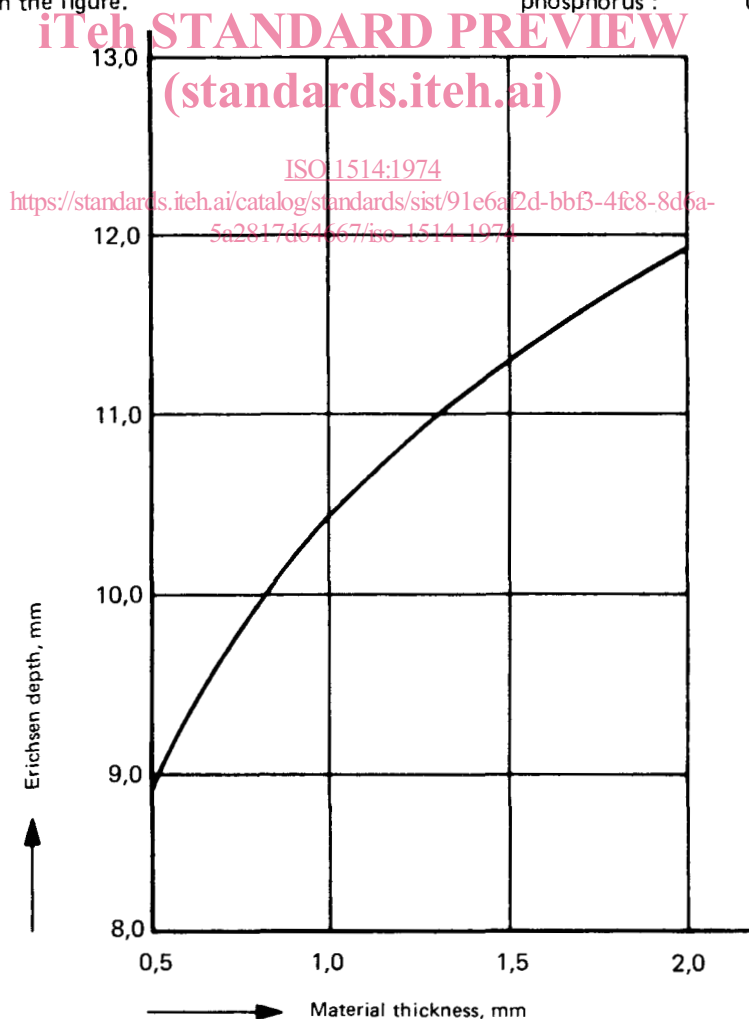


FIGURE – Minimum value of Erichsen cup for cold-reduced mild steel

ANNEX B

GENERAL GUIDANCE ON PREPARATION OF STEEL PANELS BY BLAST-CLEANING

Preparation of steel panels by blast-cleaning is not intended for cold-rolled steel sheet, but may be required for ferrous structural materials such as girders or plates of hot-rolled steel, cast iron, etc. For such purposes, the following general guidance is given.

The abrasive should be directed at right angles to the panel surface and at a speed of not less than 75 m/s. This can conveniently be done using compressed air at a pressure of 0,4 N/mm² to project the abrasive through a suitable nozzle.

The abrasive used and the compressed air supply shall be perfectly dry and clean.

The particle size of the abrasive used may conveniently be between 0,5 and 1,5 mm, but finer abrasive may be specified for particular tests.

To ensure uniformity of particle size of the abrasive and to avoid the transfer of contamination from one panel to another, the abrasive shall be used once only. It should be noted that the use of abrasives containing silica is subject to regulations in some countries.

The abrasive used shall have sharp edges and be of material harder than the standard steel panel being blasted. Carborundum is satisfactory, and also steel grit of Vickers hardness number not less than 750 HV.

Blast-cleaning shall be continued until the surface shows a blast-cleaned pattern of clean, bare steel completely free from any contamination or discoloration.

It is necessary to remove all particles of abrasive from the blasted panels by means of a jet of compressed dry air.

The panel shall be painted as soon as possible after blast-cleaning and certainly within 2 h. Alternatively, if circumstances prevent this, the panels shall be stored (for a few days only) in a desiccator until required for painting.

Particular care shall be taken to ensure that the surface is not touched by hand or otherwise contaminated before painting.

Panels prepared as above shall have a surface roughness (as defined in ISO/R 468) not greater than 0,10 mm.

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