INTERNATIONAL STANDARD ISO 2814

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Paints and varnishes — Comparison of contrast ratio (hiding power) of paints of the same type and colour

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FOREWORD

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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.

International Standard ISO 2814 was drawn up by Technical Committee ISO/TC 35, *Paints and varnishes,* and circulated to the Member Bodies in May 1972.

It has been approved by the Member Bodies of the following countries :

Austria	Iran	Romania
Chile	Israel	South Africa, Rep. of
Czechoslovakia	Italy	Sweden
Egypt, Arab Rep. of	Netherlands	Switzerland
France	New Zealand	Turkey
Germany	Poland	United Kindgom
India	Portugal	U.S.S.R.

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Canada
Ireland
U.S.A.

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Paints and varnishes — Comparison of contrast ratio (hiding power) of paints of the same type and colour

0 INTRODUCTION

This International Standard is one of a series dealing with the sampling and testing of paints, varnishes and related products. It should be read in conjunction with ISO 1512, *Paints and varnishes — Sampling*, and ISO 1513, *Paints and varnishes — Examination and preparation of samples for testing.*

The method specified in this International Standard has been worked out after careful study by an ISO Task Group. The method, comparison of contrast ratio of films drawn down on a black and white substrate at equal wet film thickness, is the simplest of those investigated and has been found to give a reproducible comparison for paints of similar type. Because different operators using the same film coating device obtain films differing significantly in thickness, probably due to variation in pressure on the applicator, the method is not satisfactory as an absolute method for the determination of hiding power and the development of an International Standard for this is still in progress.

The objective of this work was to standardize a method relating closely to practical application. For this reason the wet film thickness (or spreading rate) has been specified rather than the dry film thickness or mass. The wet film thickness selected, approximately 50 μm, corresponds to a spreading rate of approximately 20 m^2/l; for most paints this represents an average for brush application of a free-flowing paint on a smooth, non-porous surface.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the standard method to be used in comparing the contrast ratios given by paint films of white or light colours, of reflectance factor greater than 40 %, dried at normal air temperatures and applied at approximately equal wet film thickness to black and white substrates.

ISO ...[1] specifies a method for determining the hiding power (contrast ratio) of a paint.

2 APPARATUS

2.1 Substrate

One of the following substrates shall be chosen :

2.1.1 *Cards*, measuring at least 100 mm × 200 mm, thickness 0,2 to 0,35 mm, printed and varnished to give adjacent black and white areas readily wetted by, but impervious to, solvent- or water-thinned paints. The black and white areas shall each be of a minimum 80 mm × 80 mm size. The reflectance of the white areas of the card shall not be less than 75 % no more than 85 % and that of the black areas shall not be more than 5 %. The reflectance of white areas of the cards in comparative tests shall not vary by more than ± 1 % from the mean.

NOTE — Morest Chart, Form OP7, has been found suitable, but other cards, which satisfy the above requirements, may be used also. In any series of comparative tests, including interlaboratory tests, cards from the same printing shall be used.

2.1.2 *Clear transparent polyester film*, at least 100 mm × 200 mm and approximately 50 μm thick, used over black and white glass plates. The reflectance of the white plate shall not be less than 84 % nor more than 86 %, and that of the black plate shall not be more than 5 %.

2.2 Film applicator

A block applicator of rectangular shape, having a slot at least 70 mm wide ground from the underface to form a gap 100 ± 2 μm deep when the applicator is placed on an optically plane surface. The dimensions of the flat portion of the slot from front to back of the applicator block should be not less than 5 mm. By agreement, applicators with gaps other than 100 μm may be used.

2.3 Reflectometer

A photoelectric instrument giving an indicated reading proportional to the intensity of light diffusely reflected from the surface under test, within an accuracy of 1 %, and having a spectral response approximating to the CIE photopic luminous efficiency function weighted for C.I.E. Illuminant C or D 65.[2]

3 PREPARATION OF SAMPLE

Representative samples of the products to be compared shall be taken, as specified in ISO 1512. The samples shall be prepared for testing as specified in ISO 1513.

1) In preparation.

2) See Commission Internationale de l'Éclairage, CIE Compte Rendu 1963.

4 PROCEDURE

4.1 Preparation of substrate

4.1.1 *Cards*

The black and white substrate cards shall be stored, in single thickness, under the conditions of testing, 23 ± 2 °C and 50 ± 5 % relative humidity, for at least 24 h before coating and shall be handled at all times by the edges to avoid finger-marks on the areas to be coated. The card shall be prepared for coating either :

a) by fixing one end, by clips or adhesive tape, to a flat glass plate at least 6 mm thick; or

b) by using a vacuum suction plate which shall be flat to within ± 2 μm.

4.1.2 *Polyester film*

The polyester film shall be prepared for coating by spreading it on a flat glass plate at least 6 mm thick, which has first been moistened with a few drops of white spirit, just sufficient to hold the film by surface tension. Care must be taken that none of the liquid wets the upper surface of the film and that no air bubbles are trapped under the film.

4.2 Preparation of test films

Immediately before application, mix the paint thoroughly by vigorous stirring to break down any thixotropic structure, taking care not to incorporate air bubbles. Apply about 2 ml of paint in a line across one end of the card or polyester film and spread immediately by drawing down with the applicator block. Maintain a firm pressure on the block which shall be moved smoothly, at a velocity of about 100 mm/s. Maintain the coated card or polyester film horizontally, while the paint dries, preferably by taping the edges to a flat surface. Prepare at least three drawdowns from each test paint.

4.3 Conditioning of test films

Keep the test films at 23 ± 2 °C and 50 ± 5 % relative humidity for at least 16 h and not more than 168 h before the reflectance measurements are made.

4.4 Measurement of reflectance

After conditioning, coated cards are ready for reflectance measurements. Fix coated polyester film in turn over black and white glass plates, introducing a few drops of white spirit between the underside of the film and the glass to eliminate the air film and ensure optical contact.

Measure the reflectance of the test films at a minimum of four positions over the black and white substrates for each coated card or film and calculate the average reflectances R_B and R_W.

5 EXPRESSION OF RESULTS

Calculate the contrast ratio as a percentage for each coated card or film from the average reflectances over the black areas or the black substrate (R_B) and over the white areas or the white substrate (R_W) from the formula

$$\text{Contrast ratio} = \frac{R_B}{R_W} \times 100$$

Calculate the mean contrast ratio as a percentage for each paint as the mean of the contrast ratios of three coated cards or films.

6 REPEATABILITY AND REPRODUCIBILITY

The following values are valid only for white paints and paints which are slightly coloured :

6.1 Repeatability

The difference between the mean contrast ratios for each of three cards or films prepared by the same operator using the same paint, at the same time and measured with the same apparatus, shall at the 95 % confidence level, not exceed 1 unit.

6.2 Reproducibility (for one paint)

The difference between the mean contrast ratios for the same paint, obtained by different operators in different laboratories, shall, at the 95 % confidence level, not exceed 8 units.

6.3 Reproducibility (for two paints)

The difference between the mean contrast ratios of two paints, determined by two operators in different laboratories, shall, at the 95 % confidence level, not differ by more than 3 units.

NOTE – If the difference in contrast ratio of two paints in laboratory A is 10 units then the difference in contrast ratio of the two paints in laboratory B may be 7 to 13 units.

7 TEST REPORT

The test report shall include the following particulars :

a) a reference to this International Standard or a corresponding national standard;

b) whether a black and white card or a polyester film has been used;

c) type and identification of the paints tested;

d) the mean contrast ratios determined on each paint, and the number and range of replicate results;

e) any deviation, by agreement or otherwise, from the test procedure specified and the application gap used, if other than 100 μm;

f) the date of the test.