SLOVENSKI STANDARD
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Coil coated metals - Test methods - Part 22: Colour difference - Visual comparison

Bandbeschichtete Metalle - Prüfverfahren - Teil 22: Farbabstand - Visueller Vergleich

Tôles préplaquées - Méthodes d'essai - Partie 22 : Différences de couleur - Comparaison visuelle

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17.180.20	Barve in merjenje svetlobe	Colours and measurement of light
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EUROPEAN STANDARD

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English version

Coil coated metals - Test methods - Part 22: Colour difference - Visual comparison

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13523-22:2003) has been prepared by Technical Committee CEN /TC 139 "Paints and varnishes", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Part of EN 13523 describes the procedure for determining the difference in the colour of an organic coating on a metallic substrate by visual comparison against a standard using either diffuse natural daylight or artificial daylight in a standard booth.

NOTE Results may differ between natural and artificial daylight.

It may occur that two colour specimens will match in daylight but not under another light source. This phenomenon is known as metamerism (see EN 13523-15).

In case a metameric match is to be reported in objective terms, spectrophotometric measurements (using CIE Standard Illuminants D65 and A) should be made, in accordance with EN 13523-15.

No statement is made about either the precision or the accuracy of this procedure since the results derived are neither in numerical form nor do they provide a pass/fail evaluation in objective terms. Therefore, this procedure should only be used where the use of colour measuring instruments is not recommendable (evaluation of colour matches, inspection of metallic colours etc.).

Although colour measuring instruments should be used where possible, in some cases a visual comparison can be useful (evaluation of colour matches, inspection of metallic colours etc.).

The standardization of such visual comparisons, by light sources, illuminating and viewing geometry and specimen size, provides for improved uniformity of results. This practice is essential for critical colour matching and is highly recommended for colour inspections.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13523-0:2001, *Coil coated metals — Test methods — Part 0: General introduction and list of test methods.*

EN 23270, *Paint and varnishes and their raw materials — Temperatures and humidities for conditioning and testing (ISO 3270:1984).*

3 Terms and definitions

For the purposes of this Part of EN 13523, the terms and definitions given in EN 13523-0:2001 apply, together with the following.

3.1
colour
sensation resulting from the visual perception of radiation of a given spectral composition

[EN 971-1:1996]

3.2
metamerism
phenomenon characterized by the difference in colour observed when two specimens visually matching under a given light source are viewed under another light source with different spectral characteristics

4 Principle

The colour of the specimen under test is visually compared with a standard prepared under similar conditions. The comparison is carried out using either diffuse natural daylight or artificial daylight, in a standard booth.

5 Illumination for colour matching

5.1 Natural daylight

Light from a moderately overcast northern sky (for countries on the northern hemisphere). Reflection from strongly coloured neighbouring objects as well as direct sunlight should be excluded. The level of illumination shall be at least 2000 lx and shall be uniform over the viewing area.

5.2 Artificial daylight

The evaluation area shall be shielded from external light, preferably by a permanent structure (lighting cabinet). The spectral characteristics of the light source should be equivalent to those of the CIE Standard Illuminant D65. DIN 6173-2, BS 950-1 and BS 950-2 provide procedures for measuring the actual spectral energy distribution over the viewed area.

The photometric conditions require an illumination between 1000 lx (for very light colours) and 4000 lx (for very dark colours).

The manufacturer of the artificial light source shall disclose the number of running hours which his product can be expected to conform to this European Standard.

5.3 Colour-matching booth

See also EN ISO 3668.

The colour-matching booth shall be an enclosure from which external light is excluded and which is illuminated by a light source giving a spectral power distribution falling on the test specimen, approximating to that of CIE Standard Illuminant D65.

The interior of the booth for general use shall be painted a matt neutral grey (the amount of a^* and b^* shall be less than 1,0) with a lightness L^* of about 45 to 55 (Munsell N4 to N5, NCS S 5500-N to S 6500-N). However, when mainly light colours and near-white colours are to be compared, the interior of the booth may be painted so as to have a lightness L^* of about 65 (Munsell N6, NCS S 4500-N) or higher in order to give a lower brightness contrast with the colour to be examined. When mainly dark colours are to be compared, the interior of the booth may be painted matt black with a lightness L^* of about 25 (Munsell matt black, NCS S 9000-N).

NOTE L^*, a^* and b^* refer to the CIELAB system (ISO 7724-1).

To secure an appropriate surrounding field for colour comparison, the table surface in the booth shall be covered by a neutral grey panel, its luminance factor being chosen to be similar to that of the samples to be compared.

A diffusing screen shall normally be used to avoid the reflection of an image of the lamp from the test specimen. The spectral distribution properties of the lighting device shall include the spectral transmission of the screen.

6 Observer

In order to obtain the best possible results, the following is recommended:

a) It should be ensured that the observer has a good colour vision. This can be checked by a Farnsworth test.

b) Observers should wear clothing of a neutral colour.

c) Some rest periods should be allowed between the evaluation of widely differing matches as well as between long sessions.

7 Sampling

See EN 13523-0.

8 Test specimens and reference standards

8.1 Standards as well as test specimens shall be uniform in colour and gloss and free of imperfections and should preferably be flat. The preferred size of test specimens is 150 mm × 100 mm. Alternatively, if possible, specimens of a size at least larger than 120 mm × 50 mm should be used.

8.2 The standard coating shall have an acceptable light fastness, and its gloss and texture shall approximate those of the coating to be evaluated.

NOTE Since application, curing and film thickness contribute to the resulting colour, test specimens should be pretreated and coated (including application of a priming coat, if required) as specified. The dry film thickness should be determined in accordance with EN 13523-1.

9 Procedure

9.1 General

Evaluate the colour difference at ambient temperature. For more accurate comparisons, as required for instance in case of dispute, the temperature shall be (23 ± 2) °C and the relative humidity (50 ± 5) %, in accordance with EN 23270.

9.2 Day-to-day routine

Evaluate each pair of test specimens under natural or artificial daylight. Place the specimens and the standard on a table or bench at the required distance from the light source to obtain the level of illumination required. The specimens and the standard should be placed in the same plane. View the specimens and the standard at a distance of approximately 500 mm. At this distance, the observer range should be 10° in accordance with ISO/CIE 10527. To improve the accuracy of the comparison, interchange the position of the specimens and the standard and again evaluate any deviations.

For metallics and differing levels of gloss, the acceptable procedure shall be agreed between the interested parties. When exceptionally coatings of widely differing gloss levels are to be compared, special viewing techniques are required. The specimens may be compared either in natural daylight or in a colour-matching booth.

a) Viewing in natural daylight

   View the specimens at an angle which minimizes gloss differences, for example from a nearly normal direction so that the specular reflection does not reach the eye.

b) Viewing in a colour matching booth

   View the specimens at an angle of 45° with illumination of 0°.

9.3 Referee procedure

Prior to colour comparison, condition the specimens as described in EN 13523-0 whilst ensuring that direct sunlight is excluded.

Unless otherwise agreed between the interested parties, compare the colours under artificial daylight (CIE illuminant D65) only.

NOTE Experience has shown that the procedures and conditions specified in this Part of EN 13523 will make colour differences maximally visible, enabling the observer to make accurate comparisons upon which decisions can be based.

10 Expression of results

The results shall be expressed in terms of acceptable or not acceptable, and the colour shall be expressed in terms of

— darker or lighter;

— redder or greener;

— yellower or bluer.

11 Precision

No precision data are currently available.

12 Test report

The test report shall contain at least the following information:

a) all details necessary to identify the product tested;

b) a reference to this Part of EN 13523 (EN 13523-22);

c) the light source used as well as the procedure used in order to determine its spectral energy distribution;

d) details of the colour-matching booth, if used, e.g. manufacturer and lightness of the interior;

e) the result of the test, as indicated in clause 10;

f) any deviation from the test method specified;

g) the date of the test.