

BS EN 13523-22:2017



BSI Standards Publication

Coil coated metals — Test methods

Part 22: Colour difference — Visual comparison

National foreword

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European foreword

This document (EN 13523-22:2017) 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of an identical text or by endorsement, at the latest by August 2017, and conflicting national standards shall be withdrawn at the latest by August 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13523-22:2010.

The main changes are:

- a) a reference to EN 13523-0 concerning conditioning of the test panels was added;
- b) the requirement for ambient and panel temperature and relative humidity during measurement has been stated more precisely;
- c) the text was revised editorially and the normative references were updated.

The EN 13523 series, *Coil coated metals — Test methods*, consists of the following parts:

- *Part 0: General introduction*
- *Part 1: Film thickness*
- *Part 2: Gloss*
- *Part 3: Colour difference — Instrumental comparison*
- *Part 4: Pencil hardness*
- *Part 5: Resistance to rapid deformation (impact test)*
- *Part 6: Adhesion after indentation (cupping test)*
- *Part 7: Resistance to cracking on bending (T-bend test)*
- *Part 8: Resistance to salt spray (fog)*
- *Part 9: Resistance to water immersion*
- *Part 10: Resistance to fluorescent UV radiation and water condensation*
- *Part 11: Resistance to solvents (rubbing test)*
- *Part 12: Resistance to scratching*
- *Part 13: Resistance to accelerated ageing by the use of heat*

- *Part 14: Chalking (Helmen method)*
- *Part 15: Metamerism*
- *Part 16: Resistance to abrasion*
- *Part 17: Adhesion of strippable films*
- *Part 18: Resistance to staining*
- *Part 19: Panel design and method of atmospheric exposure testing*
- *Part 20: Foam adhesion*
- *Part 21: Evaluation of outdoor exposed panels*
- *Part 22: Colour difference — Visual comparison*
- *Part 23: Resistance to humid atmospheres containing sulfur dioxide*
- *Part 24: Resistance to blocking and pressure marking*
- *Part 25: Resistance to humidity*
- *Part 26: Resistance to condensation of water*
- *Part 27: Resistance to humid poultice (Cataplasm test)*
- *Part 29: Resistance to environmental soiling (Dirt pick-up and striping)*

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1 Scope

This part of the EN 13523 series specifies 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 might differ between natural and artificial daylight.

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

If 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.).

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

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13523-0:2014, *Coil coated metals — Test methods — Part 0: General introduction*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13523-0 and the following apply.

3.1 colour

sensation resulting from the visual perception of light of a given spectral composition by the human eye

Note 1 to entry: The use of the German term “Farbe” alone, i.e. not in combination of words, for coating materials is deprecated.

Note 2 to entry: A colour is characterized by hue, chroma, and lightness.

[SOURCE: EN ISO 4618:2014, 2.58]

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

[SOURCE: EN 13523-15:2015, 3.1]

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 2 000 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.

NOTE 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 1 000 lx (for very light colours) and 4 000 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).

The CIELAB values stated are for the D65/10° condition and measured using 45°:0° as a reference. Alternatively, de:8° may be used for determination of colour values.

NOTE L^* , a^* and b^* refer to the CIELAB system (EN ISO 11664-4).

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

Shall be according to 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 about 150 mm × 100 mm. 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.

Since application, curing and film thickness contribute to the resulting colour, test specimens should be pre-treated 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 ambient and panel temperature shall be (23 ± 2) °C and the relative humidity (50 ± 5) %, in accordance with EN 23270. Conditioning is carried out in accordance with EN 13523-0:2014, Clause 6.

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 11664-1. 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 13523-0:2014, Clause 6, while 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 the EN 13523 series 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;
- more/less red or more/less green;
- more/less yellow or more/less blue.

11 Precision

The concept of precision is not applicable to this European Standard.

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 the EN 13523 series (EN 13523-22);
- c) the light source used as well as the procedure used in order to determine its spectral energy distribution;
- d) the 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.

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