BS EN 13523-15:2015

BSI Standards Publication

Coil coated metals — Test methods

Part 15: Metamerism

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National foreword

This British Standard is the UK implementation of EN 13523-15:2015. It supersedes BS EN 13523-15:2002 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee STI/21, Paint systems and surface preparation for metallic substrates.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Tôles prélaquées - Méthodes d'essai - Partie 15: Métamérisme

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European foreword

This document (EN 13523-15:2015) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

This document supersedes EN 13523-15:2002.

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of an identical text or by endorsement, at the latest by January 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

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

The main technical changes are:

a) the specification concerning the test illuminant of the spectrophotometer was amended;

b) the formulas in Clause 9 were aligned with the current standards for colorimetry (EN ISO 11664-4) and metamerism index (DIN 6172);

c) a reference to EN 13523-0 concerning conditioning of the test panels was added.

EN 13523, *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 EN 13523 defines terms of the procedure for determining the metamerism of a colour match of an organic coating on a metallic substrate.

When two colour specimens have identical spectral reflection curves, they are matching under any illuminant irrespective of its spectral characteristics. This is termed a “spectral match”. It is also possible for two colour specimens having different spectral reflection curves to match visually under a given light source but not to match under another light source with different spectral characteristics; such matches are termed “metameric”.

One quantitative description of metamerism is the so-called “metamerism index”.

The information of the metamerism index is of limited value where ΔE (instrumental colour difference for a given illuminant, see EN 13523-3) is > 0,5. The metamerism index is not suited for determining the absolute colour difference or colour constancy of a given specimen at change of illuminant.

The colour difference under the reference illuminant is to be measured in colour coordinates L^*, a^* and b^* (see EN 13523-3).

Excluded from this method are organic coatings producing fluorescence and/or which are multicoloured, pearlescent or metallic.

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*

EN 13523-3, *Coil coated metals - Test methods - Part 3: Colour difference - Instrumental comparison*

EN 23270, *Paints and varnishes and their raw materials - Temperatures and humidities for conditioning and testing (ISO 3270)*

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
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

3.2
metamerism index
calculated value of the degree to which a colour difference between two specimens changes when using different illuminants

4 Principle

The colour difference of a colour match is determined under different illuminants. From the measured colour coordinates L^*, a^* and b^* the metamerism index is calculated.

5 Apparatus

5.1 Spectrophotometer (see EN 13523-3)

The spectrophotometer shall permit *L**, *a** and *b** colour coordinates to be ascertained at least under standard illuminant D65 and 10° to standard observer and standard illuminant A and 10° to standard observer. Other test illuminants may be used, in which case it shall be stated in the test report.

The circular measuring aperture shall have a minimum diameter of 10 mm.

Illumination/viewing geometry:

Geometries 45°:0° or 0°:45° are preferred but geometry d:8°is also allowed.

Any further conditions shall be the subject of a particular agreement.

The spectrophotometer shall detect as little specular reflected light as possible.

6 Sampling

See EN 13523-0.

7 Test panels

See EN 13523-0.

The surfaces to be measured shall be at least as large as the area of the measuring aperture and shall be flat against the measuring aperture.

8 Procedure

8.1 Calibration

The apparatus shall be used in accordance with the manufacturer's instructions, particularly with regard to warm-up time and calibration.

8.2 Measurement

Condition the test samples in accordance with EN 13523-0:2014, Clause 6.

Measure the colour coordinates at ambient temperature ensuring that the temperature is within the range stated by the manufacturer of the apparatus. In cases of dispute, the measurement shall be carried out under conditions of (23 ± 2) °C and a relative humidity of (50 ± 5) %, in accordance with EN 23270.

One of the specimens shall be designated the reference specimen.

First measure the colour coordinates of the reference specimen and then the colour coordinates of the test specimen.

9 Expression of results

Calculate the metamerism index MI, using the following formula:

$$MI = [(\Delta L^*_t - \Delta L^*_r)^2 + (\Delta a^*_t - \Delta a^*_r)^2 + (\Delta b^*_t - \Delta b^*_r)^2]^{1/2}$$

where

subscript t is the test illuminant being used, e.g. standard illuminant A, or a “warm white” type fluorescent lamp illuminant;

subscript r is the reference illuminant (standard illuminant D65);

$$\Delta L^*_t = \Delta L^*_{spl,t} - \Delta L^*_{std,t}$$

$$\Delta L^*_r = \Delta L^*_{spl,r} - \Delta L^*_{std,r}$$

$$\Delta a^*_t = \Delta a^*_{spl,t} - \Delta a^*_{std,t}$$

$$\Delta a^*_r = \Delta a^*_{spl,r} - \Delta a^*_{std,r}$$

$$\Delta b^*_t = \Delta b^*_{spl,t} - \Delta b^*_{std,t}$$

$$\Delta b^*_r = \Delta b^*_{spl,r} - \Delta b^*_{std,r}$$

where

subscript std is the reference specimen (standard);

subscript spl is the test specimen (sample).

10 Precision

No precision data are currently available.

11 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 13523-15);

c) the type of instrument used;

d) the illuminants used;

e) the geometry used;

f) the metamerism index, as indicated in Clause 9;

g) the components of the metamerism index, if required;

h) any deviation from the test method specified;

i) the date of the test.

Bibliography

[1] EN 1396, *Aluminium and aluminium alloys - Coil coated sheet and strip for general applications - Specifications*

[2] EN 10169, *Continuously organic coated (coil coated) steel flat products — Technical delivery conditions*

[3] EN ISO 11664 (all parts), *Colorimetry (ISO 11664)*

[4] ISO 18314 (all parts), *Analytical colorimetry*

[5] CIE 15, *Colorimetry*

[6] DIN 6172:2014, *Metamerism-index for pairs of samples at change of illuminant*

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