SLOVENSKI STANDARD
oSIST prEN 13523-3:2020

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Prevlečene kovine, ki se navijajo - Preskusne metode - 3. del: Barvna razlika - Primerjava z merilnim instrumentom

Coil coated metals - Test methods - Part 3: Colour difference - Instrumental comparison

Bandbeschichtete Metalle - Prüfverfahren - Teil 3: Farbabstand - Farbmetrischer Vergleich

Tôles prélaquées - Méthodes d'essai - Partie 3 : Différence de couleur - Comparaison au moyen d'instruments

Ta slovenski standard je istoveten z: **prEN 13523-3**

ICS:

17.180.20	Barve in merjenje svetlobe	Colours and measurement of light
25.220.60	Organske prevleke	Organic coatings

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EUROPEAN STANDARD

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prEN 13523-3

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ICS 25.220.60

Will supersede EN 13523-3:2014

English Version

Coil coated metals - Test methods - Part 3: Colour difference - Instrumental comparison

Tôles prélaquées - Méthodes d'essai - Partie 3 : Différence de couleur - Comparaison au moyen d'instruments

Bandbeschichtete Metalle - Prüfverfahren - Teil 3: Farbabstand - Farbmetrischer Vergleich

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 13523-3:2020) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13523-3:2014 and EN 13523-15:2015.

The main changes are:

a) the contents of EN 13523-3:2014 and EN 13523-15:2015 have been merged;

b) the definition for metamerism index has been added (3.4);

c) the list of the existing parts of EN 13523 has been updated;

d) the text has been editorially revised and the normative references have been 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 and metamerism — 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 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)*

1 Scope

This document specifies procedures for determining the instrumental colour difference (CIELAB) of an organic coating on a metallic substrate compared to another one used as a reference (usually called reference) and the metamerism depending on the illuminant.

When two colour specimens have identical spectral reflectance 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 reflectance 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”.

Information on the metamerism index is of limited value where ΔE (instrumental colour difference for a given illuminant) is > 0,5. The metamerism index is not suited for determining the absolute colour difference or colour consistency 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^*.

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

Establishing a reference as well as the magnitude of an acceptable colour difference are not covered by this method.

Two methods are given in this document:

a) instrumental colour difference measurement using a tristimulus colourimeter;

b) instrumental colour difference measurement using a spectrophotometer or equivalent.

Care should be taken when measuring e.g.

— textured surfaces;

— fluorescent coatings;

— metameric coatings;

— multi-coloured, pearlescent, metallic or special colour effect coatings.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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 23270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing (ISO 3270)*

EN ISO/CIE 11664-4, *Colorimetry — Part 4: CIE 1976 L*a*b* colour space (ISO/CIE 11664-4)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
colour
sensation resulting from the perception of light of a given spectral composition by the human eye

Note 1 to entry: The use of the German word “Farbe” alone, i.e. not in combinations 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
embossed coating
coating which, when dried, has been mechanically impressed with a pattern

3.3
metamerism
phenomenon perceived when two specimens have the same colour under the lighting of an illuminant, but different spectral reflection and transmission curves

[SOURCE: EN ISO 4618:2014, 2.157]

3.4
metamerism index
calculated value of the degree to which a colour difference between two specimens changes when using different illuminants

3.5
textured coating
coating which, after drying, is characterized by a regularly structured surface

[SOURCE: EN ISO 4618:2014, 2.255]

4 Principle

4.1 Colour difference

The tristimulus values X, Y and Z (see EN ISO/CIE 11664-3) of both colour reference specimen (called “reference” through the text) and test specimen are measured using the same illuminant (see EN ISO 11664-2). The L^*, a^*, b^* values (see EN ISO/CIE 11664-4) derived from these X, Y and Z values are used to describe the colour difference between the reference and the test specimen.

4.2 Metamerism Index

The colour difference between the reference specimen and test specimen is determined under different illuminants (see EN ISO 11664-2). From the measured colour coordinates L^*, a^* and b^*, the metamerism index is calculated.

5 Apparatus

Ordinary laboratory apparatus, together with the following:

5.1 Tristimulus colourimeter.

5.2 Recording spectrophotometer or equivalent.

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

Sampling shall be in accordance with EN 13523-0.

7 Test specimens

Test specimens shall be in accordance with 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

Use the apparatus 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.

The colour difference is measured between a test specimen (that is usually called sample) versus a reference specimen (that is usually called reference) under an illuminant as specified in EN ISO 11664-2.

The metamerism index will indicate if a different result is obtained under another illuminant than the one specified for the colour difference measurement.

First measure the colour coordinates of the reference specimen (or recall it if already registered in the equipment) and then the colour coordinates of the test specimen.

Measure the colour at ambient temperature in the wavelength range of at least 400 nm to 700 nm in intervals not greater than 20 nm with a half-intensity width of the monochromator less than 20 nm.

In special cases, such as highly chromatic coatings with steep spectral reflectance curves measurements in 10 nm or 5 nm intervals using a monochromator with 10 nm or 5 nm half-intensity width are more accurate.

In cases of dispute, the test temperature shall be (23 ± 2) °C and the relative humidity (50 ± 5) %, in accordance with EN 23270.

The illumination/viewing geometry shall be one of the following:

a) 45°:0° or 0°:45°;

b) integrating sphere (d:8° or 8°:d). The inclusion or exclusion of specular reflection shall be stated in the test report.

Determine first the tristimulus values of the reference or recall them from a data file. Thereafter determine the tristimulus values of the specimen to be measured.

Using these tristimulus values, calculate the colour difference and its components, using the CIELAB formula given in EN ISO/CIE 11664-4.

Usually the software associated with the spectrophotometer shall give the absolute *Lab*-values and the colour difference on each colour dimension – and the metamerism index depending on the other chosen Illuminant.

If a different colour equation is used, this shall be stated in the test report.

Colour differences shall not be compared when they are obtained by different colour scale system equations.

In case of dispute the test shall be carried out on the same equipment.

Textured and embossed coatings should be measured with an integrating sphere or with 45°-annular/circumferential illumination. An average result can be obtained by turning the specimens three times through 90° to obtain four measurements.

9 Expression of results

Express the value of the instrumental colour difference in terms of the relevant colour coordinates ΔL^* Δa^* Δb^* or ΔL^* ΔC^*_{ab} ΔH^*_{ab} in addition to the total colour difference ΔE^*_{ab}.

ΔL^*	positive	=	lighter than reference
ΔL^*	negative	=	darker than reference
Δa^*	positive	=	redder/less green than reference
Δa^*	negative	=	greener/less red than reference
Δb^*	positive	=	yellower/less blue than reference
Δb^*	negative	=	bluer/less yellow than reference
ΔC^*_{ab}	positive	=	specimen has more chroma (colour saturation) relative to the reference
ΔC^*_{ab}	negative	=	specimen has less chroma (colour saturation) relative to the reference