SLOVENSKI STANDARD
oSIST prEN 16074:2018

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Barve in laki - Določevanje nehlapnih snovi in razlivnosti premazov za kovine, ki se navijajo

Paints and varnishes - Determination of non-volatile-matter content and spreading rate of coil coating materials

Beschichtungsstoffe - Bestimmung des Gehaltes an nichtflüchtigen Anteilen und der Ergiebigkeit von Bandbeschichtungsstoffen

Peintures et vernis - Détermination de la teneur en matière non volatile et du rendement superficiel spécifique de revêtements pour prélaquage

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ICS:

87.040	Barve in laki	Paints and varnishes

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EUROPEAN STANDARD

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Paints and varnishes - Determination of non-volatile-matter content and spreading rate of coil coating materials

Peintures et vernis - Détermination de la teneur en matière non volatile et du rendement superficiel spécifique de revêtements pour prélaquage

Beschichtungsstoffe - Bestimmung des Gehaltes an nichtflüchtigen Anteilen und der Ergiebigkeit von Bandbeschichtungsstoffen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 139.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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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 16074:2018) 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 16074:2011.

The main changes are:

a) the symbols have been aligned with current standards [ISO 3251 and ISO 3233 (all parts)], i.e. *m* for mass, *s* for spreading rate, NV for non-volatile matter and *ρ* for density;

b) the text has been editorially revised and the normative references have been updated.

1 Scope

The method specifies the gravimetric procedure for determining the non-volatile-matter content as a percentage by mass of the majority of thermally cured coil coatings and subsequently for determining the theoretical spreading rate. The method is not suitable for pure epoxy coil 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, *Coil coated metals — Test methods — Part 0: General introduction*

EN ISO 1513, *Paints and varnishes — Examination and preparation of test samples (ISO 1513)*

EN ISO 2811-1, *Paints and varnishes — Determination of density — Part 1: Pycnometer method (ISO 2811-1)*

EN ISO 2811-2, *Paints and varnishes — Determination of density — Part 2: Immersed body (plummet) method (ISO 2811-2)*

EN ISO 2811-3, *Paints and varnishes — Determination of density — Part 3: Oscillation method (ISO 2811-3)*

EN ISO 2811-4, *Paints and varnishes — Determination of density — Part 4: Pressure cup method (ISO 2811-4)*

EN ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling (ISO 15528)*

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:

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

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

3.1
spreading rate
surface area that can be covered by a given quantity of coating material to give a dried film of requisite thickness

Note 1 to entry: It is expressed in m^2/l or m^2/kg.

Note 2 to entry: See also practical spreading rate and theoretical spreading rate.

[SOURCE: EN ISO 4618:2014, 2.238, modified – Application rate was deleted in Note 2.]

3.2
non-volatile matter
NV
residue by mass obtained by evaporation under specified conditions

Note 1 to entry: Instead of the term "non-volatile matter" different terms, such as solid, dry residue, dry matter, solid matter, stoving residue are being used commonly with the respective abbreviations. The term "non-volatile matter" which is also applied in ISO 3251 should be used together with the abbreviation "NV" instead of these terms.

[SOURCE: EN ISO 4618:2014, 2.176]

3.3
theoretical spreading rate
spreading rate calculated solely from the volume of non-volatile matter

[SOURCE: ISO 4618:2014, 2.256]

4 Principle

The non-volatile-matter content determination is based on the mass of dry residue of a known quantity of wet paint cured in a pan or applied on a metal panel. The spreading rate is subsequently calculated using the liquid paint density and the density of the volatile part.

5 Apparatus and materials

5.1 Analytical balance, capable of weighing to an accuracy of ± 0,000 1 g.

5.2 Flat-bottomed dish (pan), of metal or glass, inner diameter of base (75 ± 5) mm, height of the rim at least 5 mm.

Dishes having different diameters or different rims may be used by agreement between the interested parties. The actual diameter of the dish shall be within ± 5 % of the agreed value.

5.3 Mixing tool (e.g. bare wire, paperclip) to facilitate the spreading of the paint.

5.4 Methyl ethyl ketone (MEK) (CAS 78-93-3) to facilitate the spreading of the paint.

5.5 Oven capable of reaching 200 °C with an accuracy of ± 5 °C (for the pan method) and 300 °C with an accuracy of ± 5 °C (for the drawdown method).

5.6 200 µm thickness adhesive tape, which is easy to remove and leaves no residue.

5.7 Drawdown bar.

5.8 5 ml plastics pipette.

5.9 Time measuring device with a reading accuracy of 1 s.

6 Sampling

Take a representative sample of the coating material to be tested, in accordance with EN ISO 15528.

Pretest each sample in accordance with EN ISO 1513 and prepare it for further testing.

The sample shall be maintained at room temperature for at least 1 h prior to testing.

7 Test procedure

7.1 Accuracy of weighing

All weighings shall be in grams, to the nearest 0,001 g.

7.2 Procedure for coatings with the exception of PVC plastisols and pure epoxy

7.2.1 Pan method

Precondition the pans and mixing tools in an oven at 110 °C and store in a dessicator prior to use.

For each sample weigh the pan together with the mixing tool. Record this mass, in grams, as m_1.

Add a quantity as close as possible to 0,5 g or 2 g (±5 %) as agreed, accurately weighed, of paint to the pan. Weigh the pan with the paint and mixing tool. Record this mass, in grams, as m_2.

Add approximately 2 ml of methyl ethyl ketone (MEK) to the paint in the pan and spread the paint across the pan, using the mixing tool. Avoid any skin formation, contamination or waste of paint, contact of the paint with any other object, e.g. gloves.

Evaporate the MEK at room temperature for (30 ± 5) s. Do not remove the mixing tool.

Place the pan with paint and mixing tool in an oven at (165 ± 5) °C for 1 h 30 min (±5 min).

Remove the pan and allow it to cool to room temperature. Do not water cool.

Weigh again the pan, with dry paint and mixing tool. Record this mass, in grams, as m_3.

Calculate the non-volatile-matter content NV, as percentage by mass, following Formula (1):

$$\mathrm{NV} = \frac{\left(m_3 - m_1\right)}{\left(m_2 - m_1\right)} \times 100 \qquad (1)$$

where

m_1 is the mass, in grams, of the empty pan with the mixing tool;

m_2 is the mass, in grams, of the pan with the mixing tool and the test portion;

m_3 is the mass, in grams, of the pan with the mixing tool and the residue.

Repeat the procedure twice in parallel.

The non-volatile matter content, as percentage by mass, is the average of three individual measurements.

7.2.2 Drawdown method

Use an aluminium test panel of typical size 100 mm × 70 mm × 0,45 mm. The panel shall be flat, uncoated and clean. Degrease the panel with acetone, CAS 67-64-1 dry it in the laboratory oven and let it cool to room temperature.

For each sample determine the mass of the uncoated test panel. Record this mass, in grams, as m_1.

Apply one drop of wet paint from a pipette to the panel and draw down according to the paint specification and weigh immediately the panel. Record this mass, in grams, as m_2.

Cure the panel using the laboratory oven, according to the paint specification. Allow the test panel to cool to room temperature and weigh the panel. Record this mass, in grams, as m_3. Do not water cool.

Calculate the non-volatile-matter content NV, as percentage by mass, following Formula (2):

$$NV = \frac{(m_3 - m_1)}{(m_2 - m_1)} \times 100 \quad (2)$$

where

m_1 is the mass, in grams, of the uncoated test panel;

m_2 is the mass, in grams, of the test panel with the coating;

m_3 is the mass, in grams, of the test panel with the residue.

Repeat the procedure twice.

The non-volatile-matter content, as percentage by mass, shall be expressed as the average of three individual measurements (three panels may be put in the oven at the same time).

7.3 Procedure for PVC plastisol

7.3.1 Pan method

Precondition the pans and mixing tools in an oven at 110 °C and store in a dessicator prior to use.

For each test sample weigh the pan together with the mixing tool. Record this mass, in grams, as m_1.

Add a quantity as close as possible to 0,5 g or 2 g (±5 %) as agreed, accurately weighed, of paint to the pan. Weigh the pan with the paint and mixing tool. Record this mass, in grams, as m_2.

Spread the paint across the pan, using the mixing tool. Avoid any skin formation, contamination or waste of paint, contact of the paint with any other object, e.g. gloves.

Place the pan with paint and mixing tool in an oven at (105 ± 5) °C for 1 h ± 5 min.

Remove the pan and allow it to cool to room temperature. Do not water cool.

Weigh again the pan, with dry paint and mixing tool. Record this mass, in grams, as m_3.

Calculate the non-volatile-matter content NV, as percentage by mass, following Formula (3):

$$NV = \frac{(m_3 - m_1)}{(m_2 - m_1)} \times 100 \quad (3)$$

where

m_1 is the mass, in grams, of the empty pan with the mixing tool;

m_2 is the mass, in grams, of the pan with the mixing tool and the test portion;

m_3 is the mass, in grams, of the pan with the mixing tool and the residue.

Repeat the procedure twice.

The non-volatile matter content, as percentage by mass, is the average of three individual measurements (three pans may be put in the oven at the same time).

7.3.2 Drawdown method

Use a panel, typically hot dip galvanized steel, size 100 mm × 70 mm × 0,65 mm. The panel shall be flat, suitably primed and clean.

Determine the mass of the primed test panel. Record this mass, in grams, as m_1.

Place a strip of the adhesive tape along each side of the panel.

Protect the backing coat side with the tape.

Apply the wet paint from a pipette sufficient to cover the coating area to the panel and draw down according to the paint specification. Remove the tapes and weigh immediately the panel. Record this mass, in grams, as m_2.

Cure the panel using the laboratory oven, according to the paint specification. Allow the test panel to cool to room temperature and weigh the panel. Record this mass, in grams, as m_3. Do not water cool.

Calculate the non-volatile-matter content NV, as percentage by mass, following Formula (4):

$$\mathrm{NV} = \frac{\left(m_3 - m_1\right)}{\left(m_2 - m_1\right)} \times 100 \tag{4}$$

where

m_1 is the mass, in grams, of the uncoated test panel;

m_2 is the mass, in grams, of the test panel with the coating;

m_3 is the mass, in grams, of the test panel with the residue.

Repeat the procedure twice.

The non-volatile matter content, as percentage by mass, shall be expressed as the average of three individual measurements (three test panels may be dried at the same time in the oven).

8 Determination of the density

Determine the density of the coating material (ρ_p) and that of the solvents in the coating material (ρ_s) to the nearest 0,001 g/cm³ in accordance with one of the methods specified in the series of standards EN ISO 2811-1, EN ISO 2811-2, EN ISO 2811-3, and EN ISO 2811-4.

9 Calculation of spreading rate of the paint

Calculate the theoretical spreading rate s_t of the paint, in square metres per kilogram, to obtain 1 µm of dry paint film using Formula (5):

$$s_t = \left(\frac{\left(m_2 - m_1\right)}{\rho_p} - \frac{\left(m_2 - m_1\right) - \left(m_3 - m_1\right)}{\rho_s} \right) \times \frac{1\,000}{\left(m_2 - m_1\right)} \tag{5}$$

where

m_1, m_2 and m_3 are as determined in Clause 7;

ρ_p is the density, in grams per cubic centimetre, of the liquid paint, as determined in Clause 8;

ρ_s is the density, in grams per cubic centimetre, of the solvents or the main solvent in the coating material.

In the case of waterborne coating materials, the density of the solvents (ρ_s) shall be the density of the total solvent composition, including water or the density which is recommended in Table 1.