



SLOVENSKI STANDARD SIST EN 927-3:2007

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Paints and varnishes - Coating materials and coating systems for exterior wood - Part 3:
Natural weathering test

Beschichtungsstoffe - Beschichtungsstoffe und Beschichtungssysteme für Holz im
Außenbereich - Teil 3: Freibewitterung

Peintures et vernis - Produits de peinture et systemes de peinture pour le bois en
extérieur - Partie 3 : Essai de vieillissement naturel

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English Version

**Paints and varnishes - Coating materials and coating systems
for exterior wood - Part 3: Natural weathering test**

Peintures et vernis - Produits de peinture et systèmes de
peinture pour le bois en extérieur - Partie 3 : Essai de
vieillessement naturel

Beschichtungsstoffe - Beschichtungsstoffe und
Beschichtungssysteme für Holz im Außenbereich - Teil 3:
Freibewitterung

This European Standard was approved by CEN on 4 May 2006.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This document (EN 927-3:2006) 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 June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

This document supersedes EN 927-3:2000.

EN 927 consists of the following parts under the general title: *Paints and varnishes — Coating materials and coating systems for exterior wood*

- *Part 1: Classification and selection*
- *Part 2: Performance specification*
- *Part 3: Natural weathering test*
- *Part 5: Assessment of the liquid water permeability*
- *Part 6: Exposure of wood coatings to artificial weathering using fluorescent UV lamps and water*

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

1 Scope

This part of EN 927 specifies a natural weathering test for exterior wood coating systems mainly intended for decoration and protection of planed and sawn wood.

The test provides a means of evaluating the performance of a wood coating system during outdoor exposure. It forms the basis for the performance specification in accordance with EN 927-2.

2 Normative references

The following referenced documents are indispensable for the application 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 927-1, *Paints and varnishes — Coating materials and coating systems for exterior wood — Part 1: Classification and selection*

EN ISO 1513, *Paints and varnishes — Examination and preparation of samples for testing (ISO 1513:1992)*

EN ISO 2409, *Paints and varnishes — Cross-cut test (ISO 2409:1992)*

EN ISO 2431, *Paints and varnishes — Determination of flow time by use of flow cups (ISO 2431:1993, including Technical Corrigendum 1:1994)*

prEN ISO 2808:2004, *Paints and varnishes — Determination of film thickness (ISO/DIS 2808:2004)*

EN ISO 2810, *Paints and varnishes — Natural weathering of coatings — Exposure and assessment (ISO 2810:2004)*

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EN ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20°, 60° and 85° (ISO 2813:1994, including Technical Corrigendum 1:1997)*

EN ISO 4628-1:2003, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 1: General introduction and designation system (ISO 4628-1:2003)*

EN ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering (ISO 4628-2:2003)*

EN ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking (ISO 4628-4:2003)*

EN ISO 4628-5, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking (ISO 4628-5:2003)*

EN ISO 4628-6, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 6: Rating of degree of chalking by tape method (ISO 4628-6:1990)*

EN ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling (ISO 15528:2000)*

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 7724-1, *Paints and varnishes — Colorimetry — Part 1: Principles*

ISO 7724-2, *Paints and varnishes — Colorimetry — Part 2: Colour measurement*

ISO 7724-3, *Paints and varnishes — Colorimetry — Part 3: Calculation of colour differences*

3 Principle

The resistance to natural weathering of the coating system under test, applied to a wood substrate, is assessed. Durability is evaluated by determining the changes in decorative and protective properties of coatings after 12 months of exposure.

The standard test substrate has been selected to be *Pinus silvestris* (European redwood or Scots pine, subsequently referred to as pine) in order to obtain relevant results more rapidly. Moreover the sapwood, which is usually present in joinery timber, is used instead of heartwood because paint failure is more evident on the former.

Differences in quality of wood, and in the weather and site conditions, are recognized and allowed for in the method by comparing the test with a reference system. The composition of the reference system (designated as "Internal Comparison Product" or "ICP") is specified in Annex A.

The standard test substrate is pine sapwood with the rear side of panels untreated. However, supplementary information on coating performance may be obtained by conducting optional tests on additional wood species, on pine modified or impregnated by industrial processes, by using a pine panel containing a water trap in its exposed face, or by coating the rear side of the panels.

Optional tests are described in Annex E. It is emphasised that they can serve only to provide additional information.

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4 Apparatus and materials

4.1 Exposure racks, inclined at an angle of 45° to the horizontal, on which the specimens are facing towards the equator, in accordance with EN ISO 2810.

4.2 Glossmeter for the measurement of specular gloss in accordance with EN ISO 2813, at 60° geometry.

4.3 Tristimulus colorimeter or **spectrophotometer** for the measurement of colour and calculation of colour difference in CIELAB colour coordinates in accordance with ISO 7724-1, ISO 7724-2 and ISO 7724-3.

4.4 Tape and cutting tool for the assessment of adhesion in accordance with EN ISO 2409.

4.5 Microscope with a magnification of ×10 for the assessment of surface defects.

4.6 Microscope for measurement of film thickness in accordance with prEN ISO 2808:2004, method 6A.

4.7 Self-adhesive, transparent tape, in accordance with EN ISO 4628-6 for the assessment of chalking.

4.8 Climate chamber

5 Sampling

Take a representative sample of the product tested or of each product in the case of a multi-coat system, as described in EN ISO 15528.

Examine and prepare each sample for testing as described in EN ISO 1513.

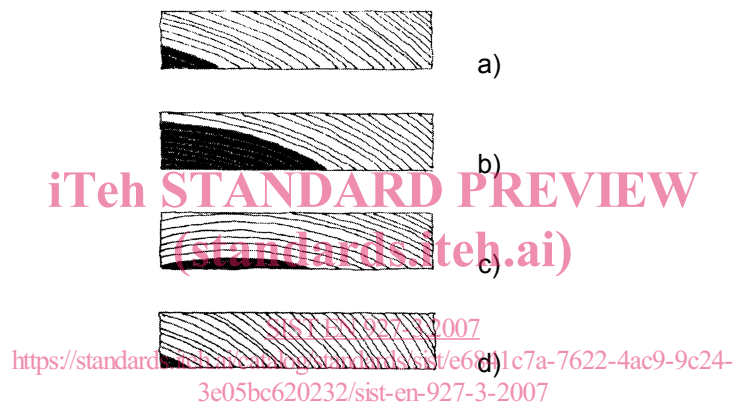
6 Test panels

6.1 Wood

The wood shall be pine that has been selected to be free from knots, cracks and resinous streaks, to be straight-grained and of normal growth rate (i.e. 3 to 8 annual rings per 10 mm). The inclination of the growth rings to the face shall be 5° to 45° (see Figure 1).

The wood shall be free from blue stain and evidence of surface or bulk fungal infection. Abnormal porosity (caused by bacterial attack) shall be avoided (see Annex B, Clause B.9).

The wood shall be conditioned at $(20 \pm 2)^\circ\text{C}$ and a relative humidity of $(65 \pm 5)\%$ (in accordance with ISO 554) to an equilibrium moisture content of $(13 \pm 2)\%$.



The top side of panels is the exposed side, the bottom is the rear face

- a) Example of a panel with no heartwood (if present) closer than 10 mm to the test surface fulfilling the requirement for growth ring orientation (5° to 45°) at the front side.
- b) This panel does not meet the specification because the heartwood is too close to the front side.
- c) This panel does not meet the specification because the growth ring orientation is not within the 5° to 45° band. The growth rings incline -10° at the left of the panel and 30° at the right. Consequently a part of the surface contains tangentially cut wood surface (growth ring inclination 0°), with considerable risk of crack formation.
- d) This panel does not meet the specification because the growth ring orientation is not within the 5° to 45° band. The growth rings incline 45° at the left of the panel and 70° at the right.

Figure 1 — Cross section of panels

6.2 Preparation and selection of wood panels

The panels shall be cut from boards planed all round and shall be nominally $(375 \pm 2) \text{ mm} \times (78 \pm 3) \text{ mm}$ and $(20 \pm 2) \text{ mm}$ thick. For details of panel preparation see Figure 2. The panels shall be planed to a smooth and uniform finish. In order to avoid aged wood surface, the panels shall be hand sanded (mesh 150) immediately before coating. Rounding of edges is not permitted.

The panels shall be selected to give a sapwood test surface on the convex side of the growth rings, with any heartwood confined to a zone no closer than 10 mm from the front side. Heartwood shall be checked with the reagent described in Annex B, Clause B.11, at both ends of each panel.

Any panels showing surface splitting shall be rejected. Where the presence of some minor defects in the test area is unavoidable, their position should be noted and their influence excluded during assessment of coating performance.

6.3 Preparation of coated panels

6.3.1 Wood conditioning

Prior to coating, condition the panels at (20 ± 2) °C and a relative humidity of (65 ± 5) % until constant mass in accordance with ISO 554. Keep the panels under the same conditions during drying of the coating system, and during subsequent storage of test panels before exposure. Panels may be transferred for brief periods to other ambient conditions where this is required for the conduct of specific operations or assessments.

6.3.2 Preparation of panels for the test coating

For each system select four panels on a random basis from the available supply. Three panels shall be used for exposure and the fourth shall be for unexposed reference.

Apply the coating system to the front and side faces of each panel. The front side of the panel is the side facing the bark of the tree. The back of the panel and end-grains shall be left uncoated.

Apply the coating system using the method specified by the manufacturer to give a wet film thickness corresponding to the mean value (± 20 %) of the manufacturer's recommended spreading rate.

Record the quantity of coating applied to each test panel and subsequently calculate a mean value for the four panels. The values should be stated preferably in g/m^2 , but may also be expressed as wet film thickness (in micrometres).

6.3.3 Preparation of panels for the Internal Comparison Product (ICP)

Prepare four panels by applying the ICP to the front and side faces of each panel. The back of the panel and end-grains shall be left uncoated. Apply the ICP by brushing in three coats allowing 16 h to 24 h drying between coats. The spreading rate shall correspond to a total of (150 ± 30) g/m^2 wet film. The dry film thickness shall be (50 ± 10) μm on pine.

One set of ICP panels exposed at the same time may serve as the comparison for one or more test coatings.

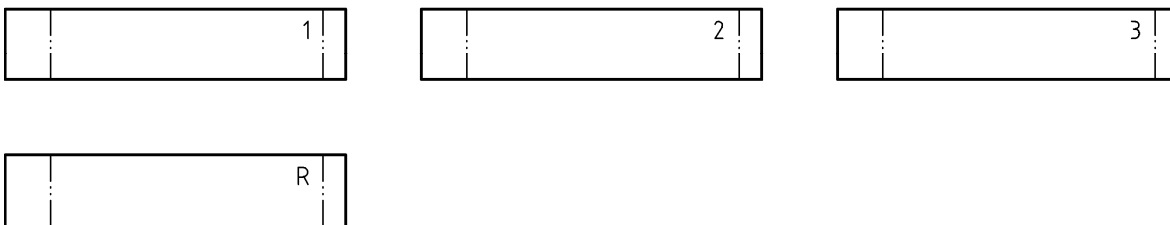
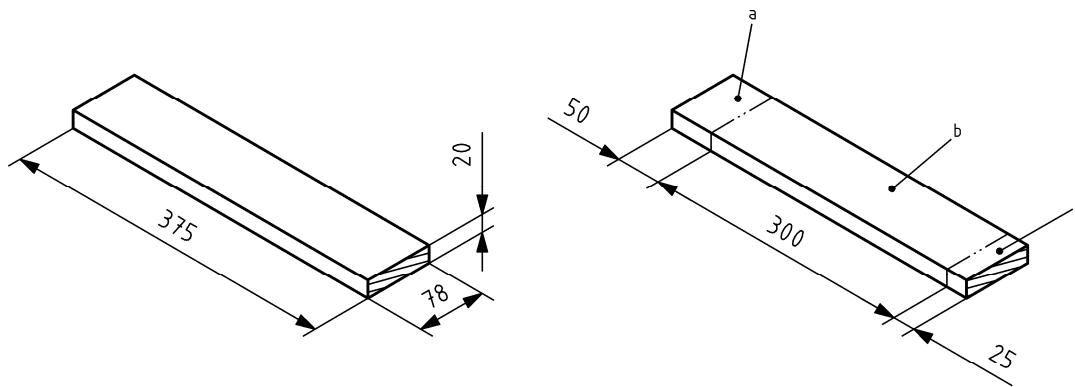
6.3.4 Sealing and ageing

When the test coatings and ICP have dried, seal thoroughly the ends of the panels with at least two coats of a flexible, moisture-impermeable white paint, for example of long-oil alkyd type, and capable of withstanding 2 years of natural exposure without breakdown. The sealer may be applied by brushing or dipping. The sealer shall be applied to the bands marked "a" and "c" at the ends of the panel shown in Figure 2. It is important that the sealer is applied all round, i.e. that front, sides, end grains and rear face of the bands are coated.

After sealing, age the panels for approximately 7 days in the controlled environment at (20 ± 2) °C and a relative humidity of (65 ± 5) % (in accordance with ISO 554), before carrying out initial panel examinations.

Exposure shall start at the latest 28 days after completion of sealing.

Dimensions in millimeters



Key

- 1, 2 and 3 Exposure panels
- R Unexposed reference panel
- a Sealed end (may be used for numbering of test panels)
- b Section for application of coating system
- c Sealed end

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NOTE The figure is not to scale.

Figure 2 — Details of test panels

6.3.5 Thickness of the coating

Determine the dry film thickness of the ICP and the test coating using the unexposed reference panels. Examine three small chips of coated wood removed from each reference panel by microscopy in accordance with prEN ISO 2808:2004, method 6A. The three chips shall be removed at three different places spaced evenly across the panel width. Make five measurements on each of the three chips and calculate and record the mean value in micrometres.

The thickness is stated in micrometres and refers to the layer on (above) the wood surface. Systems may penetrate the wood material to some extent, but this part is not included in the determination.

7 Procedure

7.1 General

Carry out all examinations in accordance with Annexes B and C.

7.2 Examination before exposure

Before exposure carry out the following measurements:

- mass of coating system applied (by weighing);
- coating thickness (see 6.3.5);
- gloss;
- colour.

Assess the adhesion on the reference panel for the test coating and the ICP.

As wood is a natural material, unexpected defects can be detected in the coated panels just before exposure, even though the wood material has been selected, inspected and prepared along the guidelines of 6.1 and 6.2. If such panels as an exception are exposed, the type, size and position of defects shall be noted, so as to avoid any influence on the assessment after exposure.

For further details see Annexes B and C.

7.3 Exposure

Expose three of the four panels with their long edge horizontal and the 50 mm band to the left of the exposed face, for a period of 12 months, using the exposure racks (4.1). Record the starting and ending dates.

Store the reference panels indoors at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %.

7.4 Examination after exposure

7.4.1 Examination on the exposure racks

At the end of the 12 months exposure period, examine the panels on the exposure racks and record any blistering. Remove the panels from the racks to the laboratory and condition for 7 days at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %.

7.4.2 Laboratory examination of unwashed panels

Assess the panels for the following properties:

- flaking;
- cracking;
- mould growth;
- chalking;
- general appearance.