

## **ПІДТВЕРДЖУВАЛЬНЕ ПОВІДОМЛЕННЯ**

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### **EN 927-2:2014**

en: Paints and varnishes — Coating materials and coating systems for exterior wood — Part 2: Performance specification

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### **ДСТУ EN 927-2:2015**

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для дерев'яних поверхонь зовнішнього застосування.

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English Version

Paints and varnishes - Coating materials and coating systems  
for exterior wood - Part 2: Performance specification

Peintures et vernis - Produits de peinture et systèmes de  
peinture pour le bois en extérieur - Partie 2: Spécifications  
de performance

Beschichtungsstoffe - Beschichtungsstoffe und  
Beschichtungssysteme für Holz im Außenbereich - Teil 2:  
Leistungsanforderungen

This European Standard was approved by CEN on 25 July 2014.

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## Foreword

This document (EN 927-2:2014) 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of an identical text or by endorsement, at the latest by March 2015, and conflicting national standards shall be withdrawn at the latest by March 2015.

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.

This document supersedes EN 927-2:2006.

The following significant technical changes have been made with respect to EN 927-2:2006:

- a) test profiles for the three main end-use categories (as defined in EN 927-1) have been updated to include additional test methods;
- b) Annex A has been deleted; further information on test methods is found in Clause 5, or the referenced test methods themselves.

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, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Introduction**

This European Standard is one of a number of parts of EN 927. EN 927-1 addresses the issue of terminology for the wide variety of exterior coatings for wood that are now available. EN 927-1 also provides a framework for communicating information on the suitability of a coating for particular specific end-use categories. Improved communication is beneficial in the removal of technical barriers to trade. However, there remains the problem of comparing products tested, or likely to be exposed, in different climatic regions, and the relevance of tests for different categories of end-use. EN 927-2 addresses these issues and sets a limited number of mandatory performance criteria combined with optional tests that can provide additional information to a standardized format.

## 1 Scope

This part of EN 927 addresses performance criteria for coating systems on exterior wood. Performance requirements are specified according to three categories of end use (defined in EN 927-1) in terms of two mandatory tests namely natural weathering performance testing carried out in accordance with EN 927-3, and water permeability in accordance with EN 927-5. Additional optional tests (non-mandatory) are tabled which may be used by suppliers, or for specification purposes, to provide additional information, to a standardized format, on aspects of performance relevant to specific situations. The majority of test methods are drawn from EN 927 (all parts), but where relevant additional tests from other national and international sources are used.

Requirements for claiming conformity with EN 927-2 are defined and provide flexibility for different situations and can also provide a basis for certification.

## 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 927-1:2013, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 1: Classification and selection*

EN 927-3:2012, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 3: Natural weathering test*

EN 927-5, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 5: Assessment of the liquid water permeability*

EN 927-6, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 6: Exposure of wood coatings to artificial weathering using fluorescent UV lamps and water*

EN 16492, *Paints and varnishes - Evaluation of the surface disfigurement caused by fungi and algae on coatings*

CEN/TS 16358, *Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of air inclusions/microfoam in coating films*

CEN/TS 16359, *Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of knot staining resistance of wood coatings*

CEN/TS 16360, *Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of film extensibility by indentation of a coating on a wooden substrate*

CEN/TS 16498, *Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of tannin staining*

CEN/TS 16499, *Paints and varnishes - Coating materials and coating systems for exterior wood - Resistance to blocking of paints and varnishes on wood*

CEN/TS 16700, *Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of resistance to impact of a coating on a wooden substrate*

EN ISO 4618:2006, *Paints and varnishes - Terms and definitions (ISO 4618:2006)*

EN ISO 4628-1, *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)*

EN ISO 7783, *Paints and varnishes - Determination of water-vapour transmission properties - Cup method (ISO 7783)*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 927-1:2013 and EN ISO 4618:2006 apply.

### 4 Performance tests – Testing profiles

EN 927-1 classifies exterior wood coatings according to appearance (75 possibilities) and three broad end-use categories. Assessment of performance is carried out with reference to the end-use categories, which are grouped according to the extent to which wood movement shall be controlled. Performance will be strongly influenced by appearance (e.g. transparent versus opaque), by substrate (e.g. wood species) and by climatic and exposure conditions. It is open to suppliers or end-users to agree a combination of tests (see Table 1 and Table 2) that suit particular situations provided that testing is carried out according to the principles described in this European Standard and includes the specified mandatory tests. Requirements for claiming conformity are described in Clause 7. When optional tests are carried out, they shall be reported according to the format described in this European Standard.

**Table 1 — Test methods**

| Property                                            | Test method (current ref.) | End-use category (see EN 927-1) |             |            |
|-----------------------------------------------------|----------------------------|---------------------------------|-------------|------------|
|                                                     |                            | Stable                          | Semi-stable | Non-stable |
| Basic classification                                | EN 927-1                   | Mandatory                       | Mandatory   | Mandatory  |
| Natural weathering on pine                          | EN 927-3                   | Mandatory                       | Mandatory   | Mandatory  |
| Natural weathering on alternative substrates        | EN 927-3                   | Optional                        | Optional    | Optional   |
| Natural weathering on alternative test piece        | EN 927-3                   | Optional                        | Optional    | Optional   |
| Water-vapour transmission properties                | EN ISO 7783                | Optional                        | Optional    | Optional   |
| Water absorption                                    | EN 927-5                   | Mandatory                       | Mandatory   | Mandatory  |
| Artificial weathering                               | EN 927-6                   | Optional                        | Optional    | Optional   |
| Knot staining                                       | CEN/TS 16359               | Optional                        | Optional    | Optional   |
| Tannin staining                                     | CEN/TS 16498               | Optional                        | Optional    | Optional   |
| Microfoam                                           | CEN/TS 16358               | Optional <sup>a</sup>           | Optional    | Optional   |
| Film extensibility                                  | CEN/TS 16360               | Optional                        | Optional    | Optional   |
| Blocking test                                       | CEN/TS 16499               | Optional                        | Optional    | Optional   |
| Impact resistance                                   | CEN/TS 16700               | Optional                        | Optional    | Optional   |
| Fungal and algae growth                             | EN 16492                   | Optional                        | Optional    | Optional   |
| <sup>a</sup> Mandatory only for spray applications. |                            |                                 |             |            |

Table 2 — Test methods in preparation

| Property                                  | Test method <sup>a</sup> | End-use category (see EN 927-1) |             |            |
|-------------------------------------------|--------------------------|---------------------------------|-------------|------------|
|                                           |                          | Stable                          | Semi-stable | Non-stable |
| Wet adhesion (parallel cross-cut)         | —                        | Optional                        | Optional    | Optional   |
| Wet adhesion (pull)                       | —                        | Optional                        | Optional    | Optional   |
| UV transmittance and transparency         | —                        | Optional                        | Optional    | Optional   |
| End grain sealing                         | —                        | Optional                        | Optional    | Optional   |
| <sup>a</sup> Currently under development. |                          |                                 |             |            |

## 5 Test overview

### 5.1 Natural weathering

#### 5.1.1 General

The assessment of a coating material to this European Standard will require a natural weathering test to be carried out in accordance with EN 927-3, using a flat wood panel of pine (*Pinus sylvestris*) with a planed surface. A manufacturer of a coating system that meets one or more of the performance criteria described in 5.1.2 can use this information as part of a claim to conformity with the specification, as described in Clause 7.

The external durability of the coating system under test is assessed by a number of performance criteria. Guide values enable an assessment to be made of the suitability of the system for the proposed end-use. Comparative trials have shown that conformity to the criteria outlined in 5.1.2 sets a repeatable and reproducible performance standard.

#### 5.1.2 Performance criteria

The scores for the assessment criteria, blistering, cracking, flaking and adhesion in according to EN 927-3 are interpreted as meeting, or not meeting the required standard, relative to the end-use category, according to the criteria given in Table 3. These rankings are relative to the exposure test site and care should be taken not to transfer the results uncritically to other geographical areas.

#### Interpretation of criteria:

- 1) The first four values in each column each represent the maximum allowed for the arithmetic mean (to one decimal place) of the three replicates from the natural weathering test in according to EN 927-3;
- 2) the maximum sum value is the limit which shall not be exceeded for the sum of the 12 ( $4 \times 3$ ) individual results;
- 3) the maximum difference to qualify as valid test refers to the difference between the highest and lowest score in any of the individual test panels. If this value is exceeded the test is declared invalid and shall be repeated;
- 4) if a coating system exceeds the maximum sum value, or maximum difference for any end-use category then the manufacturer may not claim conformity for that category.

**Table 3 — Limit values for performance criteria — Natural weathering**

|                                             | Stable | Semi-stable | Non-stable |
|---------------------------------------------|--------|-------------|------------|
| Blistering                                  | 0,3    | 0,7         | 1          |
| Cracking                                    | 0,7    | 1,7         | 3          |
| Flaking                                     | 0,3    | 0,7         | 1,3        |
| Adhesion                                    | 1      | 1           | 1          |
| Maximum sum value                           | 7      | 12          | 19         |
| Maximum difference to qualify as valid test | 2      | 3           | 4          |

NOTE Test precision: An estimate of the standard deviation of the weathering test method was made in a large comparative exercise carried out by members of the CEN Working Group. The findings of this exercise have been incorporated into the criteria matrix so that the underlying target values incorporate a tolerance to allow for variation in the performance of panel replicates. Attention has also been given to the expected distribution of results for a given test. Thus for example an arithmetic mean criterion of 1,3 for cracking could be achieved as (1,1,2), (0,1,3) or (0,0,4). The maximum difference criterion considers the probability of such scores occurring, and rules out those which are outside the expected distribution.

### 5.1.3 Exposure conditions

Exposure conditions during the test are recorded in Clause 7. The location of the exposure site shall be recorded and should ideally reflect the conditions expected in use (see EN 927-3:2012, Annex F).

### 5.1.4 Natural weathering – Alternative substrates

The weathering test may be carried on additional alternative substrates such as different wood species, heartwood, treated woods etc. performance assessment remains the same.

NOTE When optional tests are carried out, the recording of the results according to the test procedure is mandatory (see Clause 4); however, there are no performance criteria in terms of claiming conformity.

### 5.1.5 Natural weathering – Alternative test piece

As described in EN 927-3:2012, Annex E, a more severe form of the test with an additional challenge (water-trap) may be carried out. Performance assessment remains the same.

## 5.2 Existing test methods

### 5.2.1 Water permeability

Water permeability shall be assessed in accordance with EN 927-5 and expressed as a water absorption value. The water absorption value is the maximum allowed for the arithmetic mean of the five replicates as determined by the procedure described in EN 927-5.

The criteria for each end-use category are given in Table 4.

**Table 4 — Water absorption criteria for end-use categories**

|                                                                                                                                                                                                                                                     | Stable                                      | Semi-stable                                 | Non-stable            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------|-----------------------|
| EN 927-5, water absorption value                                                                                                                                                                                                                    | 30 g/m <sup>2</sup> to 175 g/m <sup>2</sup> | 30 g/m <sup>2</sup> to 250 g/m <sup>2</sup> | > 30 g/m <sup>2</sup> |
| NOTE A minimum value is stated because impermeable coating systems can lead to detrimental moisture build up in wood constructions and because the precision of the test method is questionable below the absorption value of 30 g/m <sup>2</sup> . |                                             |                                             |                       |

### 5.2.2 Artificial weathering

Coatings are exposed to UV light and water according to the procedure described in EN 927-6. After exposure, panels are assessed for flaking, cracking, blistering, chalking, adhesion, colour change, gloss and general appearance. The results are reported.

### 5.2.3 Knot staining

Resistance of the coating system to the discoloration caused by wood extractives in knots is assessed according to the procedure described in CEN/TS 16359. Colour differences recorded after the test provide an indication of the effectiveness of the coating system to resist staining.

### 5.2.4 Tannin staining

Resistance of coatings to staining by extractives from the wood material (not the same as knot staining) is carried out according to the procedure described in CEN/TS 16498. Results are recorded after a conditioning (phase 1) and after a period of exposure to high humidity (phase 2). If bleeding is present, it is recorded as a  $\Delta E$ -value.

### 5.2.5 Microfoam

The presence of microfoam in a coating system can compromise performance. Microfoam is mainly induced during application. CEN/TS 16358 provides a method for quantifying the number of air inclusions in a specified cross section of the dried film. The test may be used to evaluate the propensity of a coating to entrap air during application and for process optimization. Results are expressed as a number of air inclusions per centimetre of film. There are no specific performance criteria for this test but from experience the amount of microfoam should be less than 30 air inclusion/cm.

**NOTE** In the present state of the art, air inclusions are very difficult to avoid when coatings are spray applied on wood.

### 5.2.6 Film extensibility

Ability of a coating system to accommodate movement is a specific requirement for exterior wood coatings. Full testing of mechanical properties is quite complex. CEN/TS 16360 provides a comparatively simple method in which different size cones are pressed into the coated substrate and the size at which cracking occurs is noted.

Results are expressed as an identification letter of a cone (according to the maximum height of the cone) for which no cracking is observed after indentation.

### 5.2.7 Blocking

CEN/TS 16499 specifies a test method for determining, under standard conditions, whether a single-coat film or a multi-coat system of paints and varnishes on wood after a specified drying period is sufficiently dry to avoid damage when two painted surfaces or one painted surface and another surface are placed in contact under pressure and subsequently separated.

On completion of the test procedure, the coating system is ranked according to the force required to separate and the degree of damage caused.

### 5.2.8 Impact test

Coated wood surfaces are exposed to various impacts in service, particularly hail. CEN/TS 16700 addresses the likely damage through a falling steel ball impact test. The results are recorded as a mean value of all ratings for each dropping height.

### 5.2.9 Fungal and algal growth

Mould and algae shall be tested according to EN 927-3 and assessed according to EN 16492.

## 5.3 Test methods in preparation

### 5.3.1 Wet adhesion (parallel cross-cut test)

The possible behaviour of the coating under wet conditions is assessed according to the upcoming CEN/TS (*Determination of the wet adhesion on wood by means of a parallel cross-cut test*). After testing, the results are reported in accordance with EN ISO 4628-1.

The test may also be carried out under dry conditions.

### 5.3.2 Wet adhesion (pull-off test)

The possible behaviour of the coating under wet conditions is assessed according to the upcoming CEN/TS (*Determination of pull-off strength after water exposure*). The results are reported as pull-off-strength (in MPa) and type of fracture (cohesive failure of substrate, cohesive failure of coating, adhesive failure or mixed failure).

The test may also be carried out under dry conditions.

### 5.3.3 UV transmittance

Spectral radiation has a damaging effect on both wood and wood coatings, particularly in the UV band. Resistance to irradiation can be inferred from the natural and artificial weathering tests.

### 5.3.4 End grain sealing

The end grain of wood is particularly vulnerable to moisture uptake and for stable applications should always be sealed; sealing can also be advantageous for semi-stable and even non-stable end-uses.

## 6 Summary of test methods and reporting convention

See Table 5 for summary of the test methods.

Table 5 — Test method summary

| Property                                                                         | Test method  | Reporting convention for conformity                                 |
|----------------------------------------------------------------------------------|--------------|---------------------------------------------------------------------|
| Basic classification                                                             | EN 927-1     | Build, hiding power and gloss                                       |
| Natural weathering                                                               | EN 927-3     | Arithmetic mean value, maximum sum value and maximum sum difference |
| Artificial weathering                                                            | EN 927-6     | Test results                                                        |
| Water absorption                                                                 | EN 927-5     | Mean water absorption, in grams per square metre                    |
| Knot staining                                                                    | CEN/TS 16359 | Test results (colour difference)                                    |
| Wet adhesion (tape)                                                              | —            | Degree of damage                                                    |
| Wet adhesion (pull)                                                              | —            | Force of removal, locus of failure                                  |
| Tannin staining                                                                  | CEN/TS 16498 | Test results (colour difference)                                    |
| Microfoam                                                                        | CEN/TS 16358 | Test result – number of air inclusions                              |
| Film extensibility                                                               | CEN/TS 16360 | Test result – cone size                                             |
| Blocking test                                                                    | CEN/TS 16499 | Adherence and damage rating                                         |
| Impact resistance                                                                | CEN/TS 16700 | Damage rating                                                       |
| UV transmission                                                                  | —            | % integrated transmission at specified wavelengths                  |
| End grain sealing                                                                | —            | Moisture uptake                                                     |
| Disfigurement caused by fungal and algae growth (including blue stain organisms) | EN 16492     | Coverage ranking                                                    |

## 7 Expression of results and claiming conformity – Scope and reporting convention

The individual ratings achieved in the mandatory and optional tests shall be reported and expressed according to the conventions listed in Clause 5 and Table 5; it can also be necessary to refer to the individual test methods. Manufacturers claiming conformity with this European Standard for a specified coating system shall on request supply a data sheet containing the results in the format given in Table 6.

In order to claim conformity, a manufacturer shall:

- identify the coating or coating systems for which conformity is claimed (a data sheet in the format of EN 927-1:2013, Annex C, shall be available on request);
- identify the end-use category or categories for which compliance is claimed;
- meet the minimum requirements set in the mandatory tests for the claimed end-use category or categories;
- provide additional information from the optional tests using the specified reporting conventions.

Table 6 — Format for claiming conformity with EN 927-2

|                                                                                                                                                                                                                                                                                                                                                                      |                             |                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------|
| <b>Manufacturer: -</b>                                                                                                                                                                                                                                                                                                                                               | <b>Product or system: -</b> | <b>EN 927-1 classification: -</b> |
| <b>Category or categories for which conformity is claimed (tick alongside)</b>                                                                                                                                                                                                                                                                                       | Stable:                     |                                   |
|                                                                                                                                                                                                                                                                                                                                                                      | Semi-stable:                |                                   |
|                                                                                                                                                                                                                                                                                                                                                                      | Non-stable:                 |                                   |
| Testing organization <sup>a</sup>                                                                                                                                                                                                                                                                                                                                    |                             |                                   |
| <b>Mandatory tests <sup>b</sup></b>                                                                                                                                                                                                                                                                                                                                  | <b>Test reference</b>       | <b>Test result</b>                |
| Natural weathering                                                                                                                                                                                                                                                                                                                                                   | EN 927-3                    | Maximum sum value                 |
|                                                                                                                                                                                                                                                                                                                                                                      |                             | Maximum sum difference            |
|                                                                                                                                                                                                                                                                                                                                                                      |                             | Exposure site                     |
| Water absorption                                                                                                                                                                                                                                                                                                                                                     | EN 927-5                    |                                   |
| <b>Optional tests <sup>c</sup></b>                                                                                                                                                                                                                                                                                                                                   | <b>Test reference</b>       | <b>Test result</b>                |
|                                                                                                                                                                                                                                                                                                                                                                      |                             |                                   |
|                                                                                                                                                                                                                                                                                                                                                                      |                             |                                   |
|                                                                                                                                                                                                                                                                                                                                                                      |                             |                                   |
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|                                                                                                                                                                                                                                                                                                                                                                      |                             |                                   |
|                                                                                                                                                                                                                                                                                                                                                                      |                             |                                   |
| <sup>a</sup> Testing may be carried out by suppliers or independent testing laboratories.<br><sup>b</sup> Natural weathering and water absorption are mandatory for all end-use categories. For other mandatory tests, see Table 1.<br><sup>c</sup> Optional tests are at the discretion of the manufacturer in response to customer requirements or specifications. |                             |                                   |

## Bibliography

CEN/TS (WI 00139511)<sup>1)</sup>, *Paints and varnishes — Determination of the wet adhesion on wood by means of a parallel cross-cut test*

CEN/TS (WI 00139510)<sup>1)</sup>, *Paints and varnishes — Coating materials and coating systems for exterior wood — Determination of pull-off strength after water exposure*

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1) Currently under development.