

# **SLOVENSKI STANDARD**

## **SIST EN 15534-1:2014+A1:2018**

**01-februar-2018**

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**Kompoziti iz materialov na osnovi celuloze in plastomerov (navadno imenovani lesno-polimerni kompoziti (WPC) ali kompoziti iz naravnih vlaken (NFC)) - 1. del: Preskusne metode za karakterizacijo spojin in proizvodov**

Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 1: Test methods for characterisation of compounds and products

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Verbundwerkstoffe aus cellulosehaltigen Materialien und Thermoplasten (üblicherweise Holz-Polymer-Werkstoffe (WPC) oder Naturfaserverbundwerkstoffe (NFC) genannt) - Teil 1: Prüfverfahren zur Beschreibung von Compounds und Erzeugnissen

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Composites à base de matières cellulosiques et de thermoplastiques (communément appelés composites bois-polymères (WPC) ou composites fibres d'origine naturelle (NFC)) - Partie 1: Méthodes d'essai pour la caractérisation des compositions et des produits

**Ta slovenski standard je istoveten z: EN 15534-1:2014+A1:2017**

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**ICS:**

79.080	Polizdelki iz lesa	Semi-manufactures of timber
83.140.99	Drugi izdelki iz gume in polimernih materialov	Other rubber and plastics products

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 15534-1:2014+A1**

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**Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 1: Test methods for characterisation of compounds and products**

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This European Standard was approved by CEN on 9 November 2013 and includes Amendment 1 approved by CEN on 9 August 2017.

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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 CEN-CENELEC Management Centre or to any CEN member.

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## European foreword

This document (EN 15534-1:2014+A1:2017) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

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 May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

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

This document supersedes A1 EN 15534-1:2014 A1.

This document includes Amendment 1 approved by CEN on 09 August 2017.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

The significant changes that have been made since the previous edition are the following:

- change of the status from Technical Specification to European Standard;
- complete technical review of the test methods.

EN 15534 consists of the following parts:

- EN 15534-1, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC))* — Part 1: Test methods for characterization of compounds and products
- prEN 15534-2, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC))* — Part 2: Characterization of compounds<sup>1)</sup>
- EN 15534-4, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC))* — Part 4: Specifications for decking profiles and tiles
- EN 15534-5, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC))* — Part 5: Specifications for cladding profiles and tiles
- prEN 15534-6, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC))* — Part 6: Specifications for fencing profiles and systems<sup>1)</sup>

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<sup>1)</sup> In preparation.

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- prEN 15534-7, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 7: Specifications for general purpose profiles in external applications*<sup>1)</sup>

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## Introduction

The denomination “wood-polymer composites”, WPC, is usually used to designate materials or products consisting of one or more natural fibres or flours and one or a mixture of polymer(s). Natural fibres and flours come from different plant sources (e.g. wood, hemp, flax, sisal, coconut, cotton, kenaf, jute, abaca, banana leaf fibres, bamboo, rice, wheat straw or other fibrous material) and different polymers, virgin or recycled, are used. Currently, the most commonly used polymers are poly(vinyl chloride) (PVC), polypropylene (PP) and polyethylene (PE).

WPC materials can be processed by different techniques, as extrusion for profiles, calendering for films and sheets, injection moulding or compression moulding. The contents of natural fibres and polymers depend on the application and the processing techniques.

WPC materials may be considered neither as filled plastics nor as a special kind of wood. They should be considered as different materials having their own characteristics.

For the moment, the main applications of WPC products are decking, cladding, panelling and fencing and furniture.

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## 1 Scope

This European Standard specifies test methods for the determination of properties of composites made from cellulose-based materials and thermoplastics, usually called wood-polymer composites (WPC) or natural fibre composites (NFC).

NOTE For editorial reasons, in EN 15534 the abbreviation “WPC” is used for “composites made from cellulose-based materials and thermoplastics”.

This part of EN 15534 is applicable to cellular or non-cellular compounds and products, made from cellulose-based materials and thermoplastics, intended to be or being processed through plastics processing techniques, without threshold for the cellulose-based material content.

All the properties listed in this part of EN 15534 are not necessarily assessed for a given application. Test parameters and requirements of the test methods for a given application are specified in the relevant part of EN 15534.

Profiles for the management of electrical power cables, communication cables and power track systems used for the distribution of electrical power, profiles for windows or doors and profiles for guttering are not covered by EN 15534<sup>2)</sup>.

## 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 84:1997, *Wood preservatives - Accelerated ageing of treated wood prior to biological testing - Leaching procedure*

<https://standards.iteh.ai/catalog/standards/sist/ace71968-9a4b-46cf-b3e6-b37501d4b450/sist-en-15534-1-2014a1-2018>

EN 117:2012, *Wood preservatives - Determination of toxic values against Reticulitermes species (European termites) (Laboratory method)*

EN 152:2011, *Wood preservatives - Determination of the protective effectiveness of a preservative treatment against blue stain in wood in service - Laboratory method*

EN 317, *Particleboards and fibreboards - Determination of swelling in thickness after immersion in water*

EN 321:2001, *Wood-based panels - Determination of moisture resistance under cyclic test conditions*

EN 322:1993, *Wood-based panels - Determination of moisture content*

EN 477:1995, *Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors - Determination of the resistance to impact of main profiles by falling mass*

EN 479, *Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors - Determination of heat reversion*

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

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<sup>2)</sup> Profiles that are excluded are in the scopes of standards prepared by CEN/TC 33, CENELEC/TC 213 or CEN/TC 128.

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 1383, *Timber structures - Test methods - Pull through resistance of timber fasteners*

ENV 12038:2002, *Durability of wood and wood-based products - Wood-based panels - Method of test for determining the resistance against wood-destroying basidiomycetes*

EN 13446, *Wood-based panels - Determination of withdrawal capacity of fasteners*

EN 13823, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 13893, *Resilient, laminate and textile floor coverings - Measurement of dynamic coefficient of friction on dry floor surfaces*

CEN/TS 15083-2:2005, *Durability of wood and wood-based products - Determination of the natural durability of solid wood against wood-destroying fungi, test methods - Part 2: Soft rotting micro-fungi*

EN 16472, *Plastics - Method for accelerated photoageing using medium pressure mercury vapour lamps*

EN 20105-A02, *Textiles - Tests for colour fastness - Part A02: Grey scale for assessing change in colour (ISO 105-A02)*

CEN/TS 15676, *Wood flooring - Slip resistance - Pendulum test*

EN ISO 75-1, *Plastics - Determination of temperature of deflection under load - Part 1: General test method (ISO 75-1)*

EN ISO 75-2, *Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite (ISO 75-2)*

EN ISO 178:2010, *Plastics - Determination of flexural properties (ISO 178:2010)*

EN ISO 179-1, *Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test (ISO 179-1)*

EN ISO 291, *Plastics - Standard atmospheres for conditioning and testing (ISO 291)*

EN ISO 472:2013, *Plastics - Vocabulary (ISO 472:2013)*

EN ISO 527-2, *Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2)*

EN ISO 877-2, *Plastics - Methods of exposure to solar radiation - Part 2: Direct weathering and exposure behind window glass (ISO 877-2)*

EN ISO 1183-1, *Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1)*

EN ISO 1183-3, *Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas pycnometer method (ISO 1183-3)*

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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)*

EN ISO 4589-2, *Plastics - Determination of burning behaviour by oxygen index - Part 2: Ambient-temperature test (ISO 4589-2)*

EN ISO 4628-6, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 6: Assessment of degree of chalking by tape method (ISO 4628-6)*

EN ISO 4892-2:2013, *Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2:2013)*

EN ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227)*

EN ISO 9239-1, *Reaction to fire tests for floorings - Part 1: Determination of the burning behaviour using a radiant heat source (ISO 9239-1)*

Ⓐ<sub>1</sub> EN ISO 11664-1, *Colorimetry — Part 1: CIE standard colorimetric observers (ISO 11664-1)* Ⓐ<sub>1</sub>

Ⓐ<sub>1</sub> EN ISO 11664-2, *Colorimetry — Part 2: CIE standard illuminants (ISO 11664-2)* Ⓐ<sub>1</sub>

Ⓐ<sub>1</sub> EN ISO 11664-4, *Colorimetry — Part 4: CIE 1976 L\*a\*b\* Colour space (ISO 11664-4)* Ⓐ<sub>1</sub>

EN ISO 11925-2, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2)*

Ⓐ<sub>1</sub> EN ISO 16474-3:2013, *Paints and varnishes - Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 16474-3:2013)* Ⓐ<sub>1</sub>

ISO 11359-2, *Plastics - Thermomechanical analysis (TMA) - Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 16869, *Plastics - Assessment of the effectiveness of fungistatic compounds in plastics formulations*

Ⓐ<sub>1</sub> ISO 18314-1, *Analytical colourimetry — Part 1: Practical colour measurement* Ⓐ<sub>1</sub>

ASTM D3273-00(2005), *Standard Test Method for resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber*

CIE<sup>3)</sup> Publication 51, *A method for assessing the quality of daylight simulators for colorimetry*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 472:2013 and the following apply.

<sup>3)</sup> Commission internationale de l'éclairage, Central Bureau, Kegelgasse 27, A-1030, Vienna, Austria.

**3.1****wood-polymer composite****WPC**

or

**natural fibre composite****NFC**

material or product made thereof being the result of the combination of one or several cellulose-based material(s) with one or several thermoplastics, intended to be or being processed through plastic processing techniques

**3.2****compound**

clearly defined homogenized mixture of a base polymer and cellulose-based material with additives, i.e. pigments, stabilisers and others, at a dosage level necessary for the processing and the intended use of the final product

**3.3****cellular material**

material the density of which is reduced by creating numerous small cavities (cells), during the processing, interconnecting or not, dispersed throughout the mass

**3.4****batch**

clearly identified collection of units, manufactured consecutively or continuously under the same conditions, using material or compound conforming to the same specification

Note 1 to entry: The production batch is defined and identified by the unit manufacturer: e.g. the change of the raw material preparation, the hot-cool mixing, the shift in extruding process or the production line are considered as a new production batch.

**4 Test specimens**

The dimensions of test specimens shall be specified in the relevant test method.

The test specimens shall be selected according to the test method specifications.

For hollow products, the thickness of the test specimens shall be the actual thickness of the samples from which they are prepared and shall be declared in the test report.

**5 Conditioning of test specimens****5.1 General**

Depending on the potential application of the WPC products or on the requirements regarding the product testing, different approaches for conditioning are defined.

**5.2 Reference conditioning**

Reference conditioning is used for tests which request a high reproducibility (i.e. for comparative testing).

Unless other conditions resulting from the actual application of the WPC compounds/products, specimens shall be conditioned in the standard atmosphere 23/50, according to EN ISO 291 [(23 ± 2) °C, (50 ± 10) % RH] until a constant mass is reached.

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The atmosphere 20/65 (20 °C, 65 % RH) may also be used. In that case, these conditions shall be declared in the test report.

Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % (arithmetic mean value) determined on the basis of the mass of the cellulosic material present in the WPC material. If the content of cellulosic material is not known, it shall be determined using a suitable method.

If the tested material contains a matrix polymer which itself absorbs water (e.g. starch), the mass of the respective matrix polymer shall be added to the mass of the cellulosic material.

If the time until constant mass is reached is considered excessively long, the change in mass of the specimens shall be monitored and recorded over a period of 96 h by taking at least four measurements. Tests are conducted after conditioning for at least 96 h and the moisture content at the time of testing shall be determined according to 6.3 and stated. The content of cellulosic material of the WPC material shall be stated.

For each test method, the moisture content of one additional test specimen shall be determined according to 6.3 before testing and shall be declared in the test report.

NOTE It is most probable that the moisture equilibrium of the material is not reached but the product is assumed to be suitable for testing.

### **5.3 Conditioning for factory production control and testing under other conditions**

For the purpose of factory production control and testing under other conditions, the conditioning shall be carried out according to the specifications defined by the manufacturer. The conditioning parameters and tolerances shall be documented.

### **5.4 Conditioning for tests performed by third-parties**

In the case where the tests are performed in a test laboratory of a third party, the tests should be started from the fourth week and not later than the sixth week after the production date of the specimens. The specimens shall be stored under conditions specified in 5.2, except during the transport.

## **6 Physical properties**

### **6.1 Appearance (applicable to products)**

The surfaces of the specimens shall be illuminated by a source that complies with the CIE standard illuminant D65 (see CIE Publication No. 51) with an illumination of at least 600 lx. The light is incident upon the surfaces at an angle of approximately 45°, and the direction of viewing is approximately along the perpendicular to the plane of the surfaces.

### **6.2 Density**

The density of WPC materials shall be determined according to either EN ISO 1183-1 [Method A (immersion method), or Method C (titration method)] or EN ISO 1183-3.

For solid profiles, the density of WPC materials may also be determined according to EN 323 [1].

### **6.3 Moisture content**

The moisture content of WPC materials shall be determined according to EN 322:1993 with the following change in 5.2.

The constant mass shall be considered to be reached when the results of two successive weighing operations, carried out at an interval of seven days, do not differ by more than 0,5 % (arithmetic mean value) determined on the basis of the mass of the cellulosic material present in the WPC material.

The moisture content of WPC materials may be determined by other method(s), provided that a correlation has been established between the results obtained with this method and those obtained with EN 322, as modified above.

## 6.4 Slipperiness

### 6.4.1 General

The slipperiness of products shall be determined according to 6.4.2 (pendulum test), 6.4.3 (inclination plan test) or 6.4.4 (measurement of the dynamic coefficient of friction).

The method specified in 6.4.4 may be applied only to products which surfaces are dry in use.

### 6.4.2 Pendulum test

The slip resistance value shall be determined according to CEN/TS 15676.

### 6.4.3 Inclination plan test

#### 6.4.3.1 General

This method is based on EN 13451-1:2011, Annex E [2].

#### 6.4.3.2 Principle

A person carrying out the test (test person) moves in an upright position forward and backwards on the surface subjected to the test. The surface is wetted with water containing a wetting agent. The inclination of the test rig is increased starting from the horizontal position until an angle has been reached at which the testing person feels insecure.

#### 6.4.3.3 Testing person

The testing person is a grown-up person with bare feet, whose feet shall have been wetted for at least 10 min prior to the start of the test. The person shall be protected against a fall by a safety device, which shall allow an unrestricted movement on the surface under test.

To acquaint the test persons with the test method, they should be trained on surfaces whose anti-slip properties have been previously determined in accordance with this method.

#### 6.4.3.4 Test rig

A flat plate measuring 600 mm in width and 2 000 mm in length, with an adjustable angle of inclination from 0° to 45° shall be used as testing equipment; one short side shall be hinged to the floor and a clinometers with divisions of 1° shall be fitted on a side of the rig, showing the angle of inclination of the plate in relation to the horizontal plane.

For the safety of the test person, handrails shall be fitted to both longitudinal sides of the rig.

#### 6.4.3.5 Test liquid

The test liquid shall be an aqueous solution of a neutral wetting agent in a concentration of 1 g/l. Water may be supplied by the municipal drinking water system.