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# CEN/TS 927-9

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English Version

# Paints and varnishes - Coating materials and coating systems for exterior wood - Part 9: Determination of pull-off strength

Peintures et vernis - Produits de peinture et systèmes de peinture pour le bois extérieur - Partie 9 : Détermination de la résistance à l'arrachement

Beschichtungsstoffe - Beschichtungsstoffe und Beschichtungssysteme für Holz im Außenbereich - Teil 9: Bestimmung der Abreißfestigkeit

This Technical Specification (CEN/TS) was approved by CEN on 18 December 2022 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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## European foreword

This document (CEN/TS 927-9:2023) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

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 CEN/TS 927-9:2018.

CEN/TS 927-9:2023 includes the following significant technical changes with respect to CEN/TS 927-9:2018:

— the title has been modified.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

# Introduction

This document is one of two methods for assessing the resistance of the coating system to removal by external forces provided by either cross-cutting or direct pull-off, both methods carried out under wet conditions. Two existing ISO Standards (EN ISO 2409 and EN ISO 4624) specify similar test methods for dry substrates in general, but make no provision for wet conditions, where wood coatings are known to be particularly vulnerable. Both of the new methods take full account of the special nature of wood as a substrate in terms of the method of wetting and the selection of the substrate.

Most of the currently used exterior coating systems are characterized by their propensity to being penetrated by moisture both into and out of the wood. It might therefore be difficult to achieve a good adhesion of these coatings under high moisture conditions. In cases of an already damaged coating film or an increased presence of moisture in the boundary zone to the wood surface, even a short-term exposure to water can be sufficient to weaken the adhesion of a coating film either to the substrate or within the coating system. The described method is suitable for the testing of coatings for exterior wood or wood-based materials and applicable for testing the wet adhesion of a single coat or multi-coat system. In this test procedure the force, which is necessary to detach or pull-off the coating perpendicular to the substrate is measured.

Furthermore, the nature of fracture of the coating is assessed to validate or reject and assist in the interpretation of the result.

# 1 Scope

This document specifies a method for assessing the resistance of a coating system on wet wood to separation from the substrate by measuring the force necessary to detach or rupture the coating system by a normal tensile strain applied through an attached stud (dolly). Additional information is gained by noting the type and locus of failure. The force required for detachment will depend on several factors including the adhesion of the coating to the substrate and between intermediate coating layers. The procedure is not regarded as a direct means of measuring adhesion but an indicator of adhesive performance (adherence) under wet conditions.

A procedure for wetting the wood substrate is described. The test method is only suitable for wood and wood-based substrates.

For dry adhesion the test method can be carried out without wetting, in which case it will differ very little from EN ISO 4624.

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

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 23270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing (ISO 3270)*

EN ISO 4624:2016, *Paints and varnishes — Pull-off test for adhesion (ISO 4624:2016)*

# 3 Terms and definitions

No terms and definitions are listed in this document.

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

- ISO Online browsing platform: available at https://www.iso.org/obp
- IEC Electropedia: available at https://www.electropedia.org/

# 4 Principle

The product or system under test is applied at uniform thickness to flat wood-based panels of uniform surface texture.

After drying/curing the coating system, dollies are glued directly to the surface of the coated panels.

After curing of the adhesive, a circular groove is milled or cut around the dollies. Water is deposited in the groove for a time interval that ensures a complete wetting of the wood–coating interface beneath the dollies.

After the complete wetting of the wood-coating interphase the bonded dolly/substrate assemblies are placed in a suitable tensile tester. The bonded assemblies are subjected to a controlled tensile test (pull-off test) and the force required to break is measured.