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Фарби та лаки. Визначення властивостей проникнення водяної пари.  
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## Paints and varnishes - Determination of water-vapour transmission properties - Cup method (ISO 7783:2018)

Peintures et vernis - Détermination des propriétés de transmission de la vapeur d'eau - Méthode de la coupelle (ISO 7783:2018)

Beschichtungsstoffe - Bestimmung der Wasserdampfdurchlässigkeit - Schalenverfahren (ISO 7783:2018)

This European Standard was approved by CEN on 22 September 2018.

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## **European foreword**

This document (EN ISO 7783:2018) has been prepared by Technical Committee ISO/TC 35 "Paints and varnishes" in collaboration with 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of an identical text or by endorsement, at the latest by May 2019, and conflicting national standards shall be withdrawn at the latest by May 2019.

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.

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### **Endorsement notice**

The text of [ISO 7783:2018](#) has been approved by CEN as EN ISO 7783:2018 without any modification.

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This second edition cancels and replaces the first edition ([ISO 7783:2011](http://www.iso.org/iso/7783:2011)), of which it constitutes a minor revision to correct the conversion factor in [Formula \(3\)](#) and to add a reference to [ISO 4618](http://www.iso.org/iso/4618) on paints and varnishes terminology in [Clause 3](#).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document is one of a series of standards dealing with the sampling and testing of paints, varnishes and related products. It describes a method for determining the water-vapour transmission rate of self-supporting and non-self-supporting coatings.

The water-vapour transmission rate is not necessarily a linear function of film thickness, temperature or relative-humidity difference. A determination carried out under one set of conditions will not necessarily be comparable with one carried out under other conditions. Therefore, it is essential that the conditions of test are chosen to be as close as possible to the conditions of use.

Water-vapour transmission is of greatest interest under conditions of high humidity. For this reason, the wet-cup method has been adopted as the reference method. By agreement, other procedures and conditions, like the dry-cup method, may be used.



# Paints and varnishes - Determination of water-vapour transmission properties - Cup method

## 1 Scope

This document specifies a method for determining the water-vapour transmission properties of coatings of paints, varnishes and related products.

It supplements [ISO 12572](#). As far as possible, the procedure, the definitions and the calculations have been taken over from ISO 12572. ISO 12572 can be consulted, if necessary, to obtain a better understanding of the procedure specified in this document.

Water-vapour transmission rates of more than 680 g/(m<sup>2</sup>·d) (i.e. water-vapour diffusion-equivalent air layer thicknesses,  $s_d$ , of less than 0,03 m) are not accurately quantified by the test method described in this document.

## 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.

[ISO 1513](#), *Paints and varnishes — Examination and preparation of test samples*

[ISO 2808](#), *Paints and varnishes — Determination of film thickness*

[ISO 3233-1](#), *Paints and varnishes — Determination of the percentage volume of non-volatile matter — Part 1: Method using a coated test panel to determine non-volatile matter and to determine dry film density by the Archimedes principle*

[ISO 3696](#), *Water for analytical laboratory use — Specification and test methods*

[ISO 4618](#), *Paints and varnishes — Terms and definitions*

[ISO 15528](#), *Paints, varnishes and raw materials for paints and varnishes — Sampling*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in [ISO 4618](#) and the following apply.

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

— ISO Online browsing platform: available at <https://www.iso.org/obp>

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

### 3.1

#### **water-vapour transmission rate**

$V$

mass of water vapour that is transmitted over a given period through a given surface area of a test piece under specified constant conditions of relative humidity at each face of the test piece

Note 1 to entry: It is measured in grams per square metre per day [g/(m<sup>2</sup>·d)].

Note 2 to entry: A water-vapour transmission rate measured at atmospheric pressure,  $p$ , can be converted to the equivalent value at standard atmospheric pressure,  $p_0$ , by multiplying by  $p/p_0$ . This allows a linear correlation with the water-vapour diffusion-equivalent air layer thickness ( $s_d$ ) value (see 3.3) by the factor 20,4.

Note 3 to entry: The term “water-vapour transmission” is often incorrectly used for water-vapour transmission rate.

**3.2**  
**rate of flow of water vapour through the test piece**

$G$   
mass of water vapour that is transmitted over a given period through a test piece under specified constant conditions of relative humidity at each face of the test piece

Note 1 to entry: It is measured in grams per hour.

**3.3**  
**water-vapour diffusion-equivalent air layer thickness**

$s_d$   
thickness of a static air layer that has, under the same conditions of measurement, the same water-vapour transmission rate as the coating tested

Note 1 to entry: It is measured in metres.

**3.4**  
**water-vapour resistance factor**

$\mu$   
factor that indicates how many times greater the water-vapour resistance of a material is compared with a layer of static air of the same thickness at the same temperature and pressure

Note 1 to entry: It is dimensionless.

Note 2 to entry: The calculation and use of a water-vapour resistance factor is meaningful only if the water-vapour transmission rate of a particular material is a constant, i.e. independent of the thickness, which, however, is normally not the case for coatings.

**3.5**  
**test piece**  
<non-self-supporting coatings> supporting substrate with the coating applied to it

**3.6**  
**test piece**  
<self-supporting coatings> coating alone

**3.7**  
**wet-cup method**  
method of measuring water-vapour permeability in which the test piece is sealed to the rim of a cup containing a saturated aqueous solution of ammonium dihydrogen phosphate

Note 1 to entry: This is the most convenient manner of carrying out determinations of water-vapour permeability under conditions of high relative humidity (between 93 % and 50 %).

**3.8**  
**dry-cup method**  
method of measuring water-vapour permeability in which the test piece is sealed to the rim of a cup containing a desiccant

Note 1 to entry: This is the most convenient manner of carrying out determinations of water-vapour permeability under conditions of low relative humidity (between 50 % and 3 %).

**3.9****test assembly**

assembly consisting of a test piece sealed to the rim of a test cup containing saturated ammonium dihydrogen phosphate solution in contact with undissolved ammonium dihydrogen phosphate crystals (wet-cup method) or containing desiccant (dry-cup method)

**3.10****test area**

area of the face of the test piece through which the water vapour flows during the test

Note 1 to entry: It is measured in square metres.

**4 Principle**

A test assembly consisting of a self-supporting coating, or a non-self-supporting coating on porous substrate, sealed to the rim of a cup is placed in a test enclosure kept at a specified temperature (e.g. 23 °C) and relative humidity (e.g. 50 %). The relative humidity in the cup is maintained at a constant level — either at 93 % by means of a saturated salt solution (wet-cup method) or at 3 % by means of a desiccant (dry-cup method). Because of the difference between the partial pressure of the water vapour inside the test cup and the partial pressure of the water vapour in the test enclosure, water vapour diffuses through the coating under test. By weighing the test assembly at suitable time intervals, the change in mass of the test assembly is followed. From the change in mass and the test area, the water-vapour transmission rate and the water-vapour diffusion-equivalent air layer thickness are calculated.

**5 Apparatus and materials****5.1 Substrate for non-self-supporting coatings**

Any homogenous, porous material which has a water-vapour transmission rate above 240 g/(m<sup>2</sup>·d) is suitable for use as the substrate for non-self-supporting coatings, for instance polyethylene frits, cellular-concrete discs, glass frits, unglazed ceramic tiles.

When using cellular-concrete substrates, the coating shall be applied on the smooth side.

If the coating system under test does not include a primer and it is necessary to use one before applying the coating system under test, do so, but the transmission rate of the primed substrate will have to be determined separately.

**5.2 Test cup**

Test cups are made of glass, plastic or metal. The test cup used shall be resistant to corrosion under the conditions of the test.

NOTE For aluminium test cups, a wall thickness of 1 mm has been found to be satisfactory.

The exact surface area of the test piece exposed is defined by the design of the cup. The area of the exposed surface shall be at least 50 cm<sup>2</sup> for non-self-supporting coatings and at least 10 cm<sup>2</sup> for self-supporting coatings.

The cup shall be so designed that an efficient seal is made between it and the test piece, using sealing material (see 5.5), if necessary.

When the saturated solution (5.3) or desiccant (5.4) has been placed in the cup, the area of the surface of the saturated solution or desiccant shall be similar to that of the exposed surface of the test piece. The air gap between the test piece and the surface of the solution or desiccant shall be between 10 mm and 30 mm.