

**ISO 3233-1:2019**



**EN ISO 3233-1:2019**

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**Paints and varnishes - Determination of 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 3233-1:2019)**

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**Paints and varnishes - Determination of 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 3233-1:2019)**

Peintures et vernis - Détermination du pourcentage en volume de matière non volatile - Partie 1: Méthode utilisant un panneau d'essai revêtu pour déterminer la matière non volatile et pour déterminer la masse volumique du feuil sec par le principe d'Archimède (ISO 3233-1:2019)

Beschichtungsstoffe - Bestimmung des Volumens nichtflüchtiger Anteile - Teil 1: Verfahren mit einem beschichteten Probenträger zum Bestimmen des nichtflüchtigen Anteils und zum Bestimmen der Trockenfilmdichte nach dem Archimedes-Prinzip (ISO 3233-1:2019)

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EN ISO 3233-1:2019 (E)

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## European foreword

This document (EN ISO 3233-1:2019) 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of an identical text or by endorsement, at the latest by June 2020, and conflicting national standards shall be withdrawn at the latest by June 2020.

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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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, 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, Turkey and the United Kingdom.

## Endorsement notice

The text of ISO 3233-1:2019 has been approved by CEN as EN ISO 3233-1:2019 without any modification.

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**Paints and varnishes — Determination  
of 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**

*Peintures et vernis — Détermination du pourcentage en volume de  
matière non volatile —*

*Partie 1: Méthode utilisant un panneau d'essai revêtu pour  
déterminer la matière non volatile et pour déterminer la masse  
volumique du feuil sec par le principe d'Archimède*



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**ISO 3233-1:2019(E)****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 3233-1:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the definitions and sources have been updated in [Clause 3](#);
- a minimum mass of 25 mg of the coating on the plate has been added in [7.4.1](#) because measurements and simulation calculations demonstrate the need for a minimum mass for the coated panel;
- the text has been editorially revised.

A list of all parts in the ISO 3233 series can be found on the ISO website.

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 method is used to measure the density and to determine the volume of a dry coating obtainable from a given volume of liquid paint. This volume is considered to be the most meaningful measure of the coverage (area of surface covered at a specified dry-film thickness per unit volume) of a paint, varnish or related product. The value obtained by this method might not be the same as that calculated on the basis of the addition of masses and volumes of the raw materials in a formulation. The volume occupied by a combination of resin and solvent can be the same as, greater than or less than the combined volume of the separate components, due to contraction or expansion of the resin and solvent. A second factor affecting the volume of a dry coating formulation is the degree to which the spaces between pigment particles are filled with binder. A third factor is the use of volatile components in reactive systems that, by their reaction, change into non-volatile film-building materials, i.e. amines and reactive solvents in high-build two-component coating materials.

Above and close to the critical pigment volume concentration, the volume of a dry paint film is greater than the theoretical volume, due to an increase in unfilled voids between pigment particles. The porosity of the film means that this method is unsuitable.

The values obtained for the non-volatile matter by volume are dependent on the temperature and time of heating, and these conditions should be carefully considered for the material being tested.



# Paints and varnishes — Determination of 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

## 1 Scope

This document specifies a method for determining the non-volatile matter by volume ( $NV_V$ ) of coating materials and related products by measuring the density of a dried coating for any specified temperature range and period of drying or curing. This method determines the non-volatile matter immediately after application.

Using the non-volatile matter by volume results obtained in accordance with this document, it is possible to calculate the spreading rate of coating materials.

The method specified in this document is the preferred method for air-drying materials. Its use for other materials has not yet been tested.

[Annex B](#) gives an overview of the existing methods for determination of non-volatile-matter content and volume of non-volatile matter.

This document is not applicable to coating materials in which the critical pigment volume concentration is exceeded.

## 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 2811 (all parts), *Paints and varnishes — Determination of density*

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/>