
**Paints and varnishes — Determination of
percentage volume of non-volatile matter
by measuring the density of a dried coating**

*Peintures et vernis — Détermination du pourcentage en volume de
matières non volatiles par mesurage de la masse volumique d'un
revêtement sec*



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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 3233 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 3233:1984), which has been technically revised.

The technical changes are that plates can also be used as test pieces (receptacles) besides discs, and that the drying conditions for all types of coating material are specified. The plates are used for thixotropic or other coatings which can be drawn down by a doctor blade.

Annex A forms an integral part of this International Standard.

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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 coating. 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 may 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 may be the same as, greater than or less than the combined volume of the separate components, since contraction or expansion of resin solutions in this way is a function of the solubility characteristics of the resin and the 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 by measuring the density of a dried coating

1 Scope

This International Standard is one of a series of standards dealing with the testing and sampling of paints, varnishes and related products.

It specifies a procedure for determining the volume percentage of non-volatile matter in paints, varnishes and related products by measuring the density of a dried coating for any specified temperature range and period of drying or curing.

The method is not suitable for paints formulated above the critical pigment volume concentration.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1512:1991, *Paints and varnishes — Sampling of products in liquid or paste form.*

ISO 1513:1992, *Paints and varnishes — Examination and preparation of samples for testing.*

ISO 2811-1:1997, *Paints and varnishes — Determination of density — Part 1: Pyknometer method.*

ISO 2811-2:1997, *Paints and varnishes — Determination of density — Part 2: Immersed body (plummet) method.*

ISO 2811-3:1997, *Paints and varnishes — Determination of density — Part 3: Oscillation method.*

ISO 2811-4:1997, *Paints and varnishes — Determination of density — Part 4: Pressure cup method.*

ISO 3251:1993, *Paints and varnishes — Determination of non-volatile matter of paints, varnishes and binders for paints and varnishes.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 volume of non-volatile matter: The volume of the residue obtained when a uniform and specified thickness of the product under test is cured or dried at a specified temperature for a specified period.