
**Paints and varnishes — Electro-
deposition coatings —**

**Part 16:
Pigment-binder ratio**

Peintures et vernis — Peintures d'électrodéposition —

Partie 16: Rapport du pigment au liant

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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).

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).

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.

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

A list of all parts in the ISO 22553 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.

Introduction

An electro-deposition-coating material (e-coat) consists of a pigment paste and a binder. This test method determines the ratio of both components in the electro-deposition-coating material.

When determining the ash content, a certain proportion is always lost (ignition loss), and then added on the pigment content. Therefore, the ash content and the pigment content cannot be equated. This is considered by a product specific correction factor.

The pigment-binder ratio is a key characteristic for controlling the e-coat bath.

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Paints and varnishes — Electro-deposition coatings —

Part 16: Pigment-binder ratio

1 Scope

This document specifies a test method for determining the pigment-binder ratio.

It applies to electro-deposition coatings for automotive industries and other general industrial applications, e.g. chiller units, consumer products, radiators, aerospace, agriculture.

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 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content*

ISO 4618, *Paints and varnishes — Terms and definitions*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

ISO 22553-1, *Paints and varnishes — Electro-deposition coatings — Part 1: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and ISO 22553-1 apply.

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 non-volatile-matter content and the ash content of the electro-deposition-coating material are determined. The pigment-binder ratio is calculated from these determinations.

5 Determination of pigment content

5.1 Apparatus

Ordinary laboratory apparatus are used, together with the following.

5.1.1 Porcelain crucible, high form.

5.1.2 Oven with horizontal ventilation in which the test temperature of 105 °C can be held to within ± 2 °C.

5.1.3 Crucible tongs.

5.1.4 Muffle furnace or rapid incinerator.

5.1.5 Analytical balance, accurate to 0,001 g.

5.1.6 Desiccator.

5.2 Sampling

Take a representative sample of the product to be tested, as specified in ISO 15528.

Examine and prepare each sample for testing, as specified in ISO 1513.

5.3 Procedure

Carry out the determination in duplicate.

Glow a porcelain crucible (5.1.1) in a muffle furnace or rapid incinerator (5.1.4) at the temperature intended for the ashing test till constant mass (m_1) and store it in the desiccator (5.1.6) after cooling.

Weigh 2 g to 3 g of the sample (m_2) to the nearest 0,001 g in the porcelain crucible. Stove it for 30 min at a temperature of (105 ± 2) °C in the oven (5.1.2). Then take the porcelain crucible off the oven and bring it into the muffle furnace or rapid incinerator. Heat to the ashing temperature of about 600 °C to 900 °C and leave it there for at least 1 h.

Allow the porcelain crucible to cool down in the desiccator for at least 30 min. Then weigh the porcelain crucible to the nearest 0,001 g, bring it into the muffle furnace or rapid incinerator for another 15 min, allow it to cool down in the desiccator and weigh again. Repeat this procedure until the mass is constant to 0,001 g (m_3).

5.4 Calculation of the pigment content

Calculate the ash content, w_{ash} , as a mass fraction in percent (absolute) using [Formula \(1\)](#):

$$w_{\text{ash}} = \frac{m_3 - m_1}{m_2} \times 100 \quad (1)$$

where

m_1 is the mass, in grams, of the porcelain crucible;

m_2 is the mass, in grams, of the sample;

m_3 is the mass, in grams, of the porcelain crucible with the residue on ignition.

If the two results (duplicates) differ by more than 0,2 % (absolute), repeat the procedure described in [5.3](#).

Calculate the mean value from two valid determinations (replicates) and state it to the nearest 0,1 % (absolute).

Calculate the pigment content, w_{pig} , as a mass fraction in percent (absolute) using [Formula \(2\)](#) using the ash content and a product specific correction factor:

$$w_{\text{pig}} = a \times w_{\text{ash}} \quad (2)$$

where

a is the product specific correction factor;

w_{ash} is the ash content, as a mass fraction in percent (absolute).

NOTE The correction factor considers the composition of the solids content such as pigment and extender and is given by the paint manufacturer.

6 Determination of the binder content

6.1 Procedure

Determine the non-volatile-matter content (NV) of the electro-deposition-coating material as a mass fraction in percent, in accordance with ISO 3251 and the test parameters given in [Table 1](#).

Table 1 — Test parameters for the determination of the non-volatile-matter content

	Variation 1	Variation 2
Period of heating	30 min	180 min
Temperature	180 °C	105 °C
Mass of test portion	(1,0 ± 0,1) g	

6.2 Calculation of the pigment-binder ratio

Calculate the binder content, w_{bin} , as a mass fraction in percent (absolute) using [Formula \(3\)](#):

$$w_{\text{bin}} = \text{NV} - w_{\text{pig}} \quad (3)$$

where

NV is the non-volatile-matter content, as a mass fraction in percent (absolute);

w_{pig} is the pigment content, as a mass fraction in percent (absolute).

7 Calculation of the pigment-binder ratio

Calculate the pigment-binder ratio w_{pbr} , as the relation of mass fractions in percent (absolute) using [Formula \(4\)](#):

$$w_{\text{pbr}} = \frac{w_{\text{pig}}}{w_{\text{bin}}} \quad (4)$$

where

w_{pig} is the pigment content, as a mass fraction in percent (absolute);

w_{bin} is the binder content, as a mass fraction in percent (absolute).

8 Precision

No precision data are currently available.

9 Test report

The test report shall contain at least the following information:

- a) all details necessary for the identification of the tested coating material;
- b) a reference to this document, i.e. ISO 22553-16:2022;
- c) the pigment-binder ratio in accordance with [Clause 7](#);
- d) any agreed or other deviation from the specified test method;
- e) any unusual observation (anomalies) observed during the test;
- f) the date of the test.

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