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

**Part 8:
Electric charge density**

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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).

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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

The electric charge density provides information about the efficiency of the deposition process during electro-deposition coating.

If measurement of the electrical wet-film resistance in accordance with ISO 22553-7 is necessary, this can be specified in the test assembly provided.

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Paints and varnishes — Electro-deposition coatings —

Part 8: Electric charge density

1 Scope

This document specifies a method for determining the electric charge density of an electro-deposition coating (e-coat) 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 1514, *Paints and varnishes — Standard panels for testing*

ISO 2808, *Paints and varnishes — Determination of film thickness*

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

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

ISO 23321, *Solvents for paints and varnishes — Demineralized water for industrial applications — Specification and test methods*

3 Terms and definitions

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

electric charge density

volume electric charge

ρ_A

quotient of electrical charge Q and volume V :

$$\rho_A = \frac{Q}{V}$$

Note 1 to entry: The electric charge density is expressed in coulombs per cubic metre ($\text{C}\cdot\text{m}^{-3}$).

Note 2 to entry: $1 \text{ C}\cdot\text{m}^{-3} = 1 \text{ A}\cdot\text{s}\cdot\text{m}^{-3}$.

3.2
practical dry-film density
practically determined density of a dried and cured coating

[SOURCE: ISO 3233-3:2015, 3.4, modified: a hyphen was added to the term, between "dry" and "film".]

3.3
theoretical dry-film density
coating density calculated from the densities of the solvents, coating materials and the non-volatile-matter content of the coating material

[SOURCE: ISO 3233-3:2015, 3.6, modified: a hyphen was added to the term, between "dry" and "film".]

4 Principle

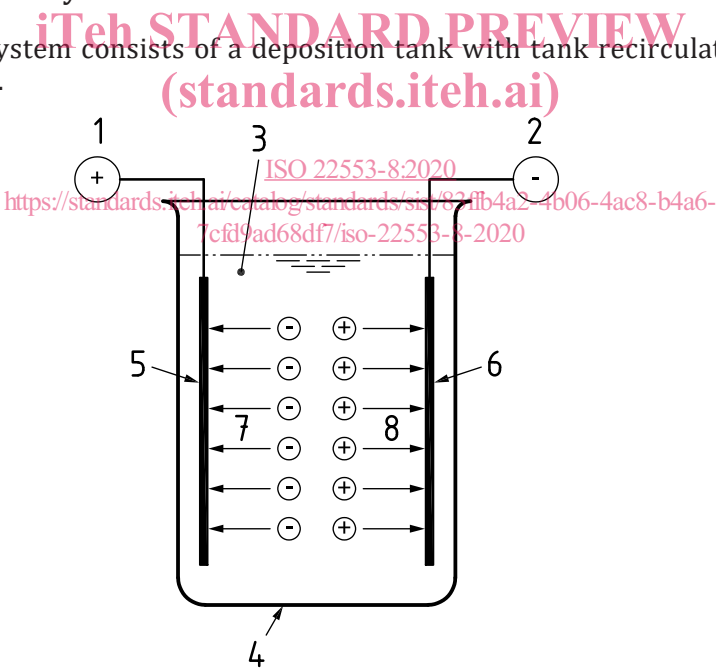
A defined area of a test panel is coated and the coating is stoved. The film thickness is measured. The determination is carried out between the minimum and critical current densities.

5 Apparatus and materials

Typical laboratory apparatus, together with the following:

5.1 Laboratory deposition system.

A laboratory deposition system consists of a deposition tank with tank recirculation and DC voltage equipment — see Figure 1.



Key	
1 anode	5 anode (counter electrode for cathodic e-coat)
2 cathode	6 cathode (test panel for cathodic e-coat)
3 electro-deposition coating material	7 acid
4 deposition tank	8 electro-deposition coating material

Figure 1 — Schematic diagram of a laboratory deposition system with cathodic e-coat material as an example

The container of the deposition system shall be filled with the electro-deposition coating material and the tank circulation (stirrer or pump) initiated. Subsequently, the test panels shall be immersed in the

container. The deposition conditions shall be adjusted according to the specification and the deposition process is initiated. Upon completion of the deposition process the test panels shall be removed from the container and thoroughly rinsed using demineralized water specified in ISO 23321, so that any excess of the electro-deposition coating material (cream coat) is removed.

5.2 Amperemeter.

5.3 Thermometer, with a reading accuracy of 0,1 °C.

5.4 Film thickness measuring device, with a measurement error of 0,1 µm.

5.5 Analytical balance, with a weighing accuracy of 0,000 1 g.

5.6 Oven, in which the test can be carried out reliably and in which the specified or agreed test temperature can be held to within ± 2 °C (for temperatures up to 150 °C) or $\pm 3,5$ °C (for temperatures between 150 °C and 200 °C).

6 Test panels

Use electrically conductive test panels with pre-treatment as specified in ISO 1514 with dimensions of approx. 190 mm × 105 mm × 0,75 mm.

7 Number of determinations

Carry out each determination in duplicate.

8 Sample preparation

Mask the test panels using a temperature-resistant tape in such a way that an area to be coated (sum of the front and back sides of the test panel) of approx. 280 cm² results (see [Figure 2](#)). Measure the exact area and state it in the test report.