International Standard

ISO 22785-8

# Paints and varnishes — Coatings on plastics and composites —

## Part 8: Film thickness

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# Foreword

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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 22785 series can be found on the ISO website.

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# Introduction

The chemical and physical properties of plastics and composites as substrates are very different from those of metallic substrates.

In contrast to metals, plastics generally are not electrically conductive and are not magnetic. For this reason, magnetic and electromagnetic methods cannot be used to measure film thickness on plastic substrates.

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# Paints and varnishes — Coatings on plastics and composites —

# Part 8: Film thickness

## 1 Scope

This document specifies the determination of the film thickness of coatings on plastics, plastic composites and similar substrates.

It also provides an overview of common test methods for determination of wet-film thickness and dry-film thickness.

## 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.

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ISO 4618, *Paints and varnishes — Vocabulary*

ISO 22785-1, *Coatings on plastics and composites — Part 1: General introduction*

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## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and ISO 22785-1 and the following 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/

**3.1**
**film thickness**
distance between the surface of the film and the surface of the substrate

[SOURCE: ISO 2808:2019, 3.1]

**3.2**
**wet-film thickness**
thickness of a freshly applied wet coating material, measured immediately after application

[SOURCE: ISO 2808:2019, 3.2]

**3.3**
**dry-film thickness**
thickness of a coating remaining on the surface when the coating has hardened

[SOURCE: ISO 2808:2019, 3.3]

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**3.4**
**test area**
representative part of the relevant surface area, within which an agreed number of single measurements is made as a spot-check

[SOURCE: ISO 2808:2019, 3.6, modified — Note 1 to entry has been deleted.]

# 4 Test specimen characteristics and preparation

## 4.1 Test specimens

Coatings both on test specimen panels as specified in ISO 1514 and on components are tested. Depending on the selected test method, there are different requirements for the geometry of the test specimen.

Any type of flaw or damage impairs the appearance and properties of the substrate.

The coating system and the substrate are selected together with the pre-treatment and coating methods so that a homogeneous coating is achieved. The film thickness is documented in accordance with the technical requirements relating to the visual appearance and/or coating.

## 4.2 Conditioning

Conditioning serves to improve the repeatability and reproducibility of test results.

As the properties of plastics substrates depend greatly on humidity levels and conditioning usually takes longer than for metals, a longer conditioning time is usually required for plastics substrates.

The values and times to be selected depend on the test specimen to be tested.

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# 5 Determination of wet-film thickness

## 5.1 Mechanical methods

### 5.1.1 Principle

With mechanical procedures, the measuring instrument (see Figures 1, 2 and 3, Key 4) passes through by the coating being placed on the surface of the substrate. The difference between the points of contact (substrate, see Figures 1, 2 and 3, Key 1) and the coating surface touched from the top of the measurement instrument (Figures 1, 2 and 3, Key 3) corresponds to the readable wet-film thickness.

### 5.1.2 Field of application

The mechanical principle is suitable for all film-substrate combinations. The substrate is flat in at least one direction in the area where the measurement is performed. Curvature of the surface in a single plane is permissible (e.g. internal or external surface of pipes).

### 5.1.3 General

The classification as a destructive or non-destructive process depends on

a) the rheological properties of the coating material;

b) the nature of the wetting contact between the contact surfaces of the measurement instrument and the coating material;

c) whether the thickness measurements will make the coating unsuitable for the purpose for which it is intended.

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Since the possibility of pigment particles remaining between the gauge and the substrate cannot be excluded, all mechanical methods contain a systematic error: the film thickness displayed is smaller than the actual wet-film thickness by at least the mean diameter of the pigment particles.

In the case of a wheel gauge (5.1.5), the wheel is wetted by the coating material. If not, this represents a further source of systematic error which can result in exaggerated readings and is a function of:

— the surface tension and the rheological properties of the coating material;

— the material of the wheel gauge;

— the speed at which the wheel is turned.

### 5.1.4 Wet film comb

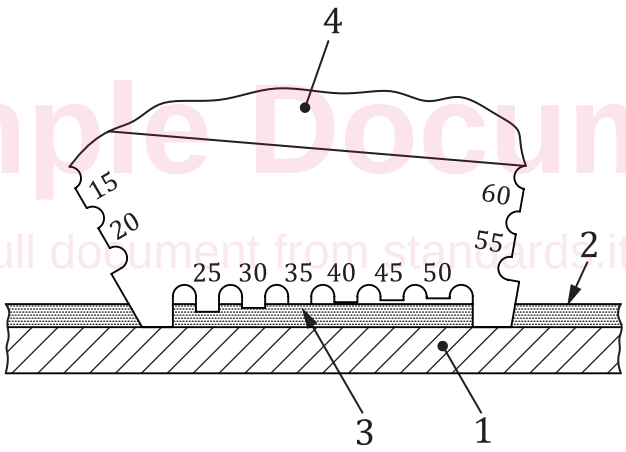
#### 5.1.4.1 Description of instrument

A comb gauge is a flat plate made of a corrosion-resistant material with teeth along its edges (see Figure 1). The reference teeth at the corners of the plate specifies a baseline along which the inner teeth are arranged to give a graduated series of gaps. Each tooth is labelled with the assigned gap value.

With commercially available comb gauges, the maximum thickness which can be measured is typically 2 000 µm and the smallest increment is typically 5 µm.

Dimensions in micrometres

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**Key**

| | |
|---|---|
| 1 | substrate |
| 2 | coating |
| 3 | point of wetting contact |
| 4 | comb gauge |

**Figure 1 — Example of a comb gauge**

#### 5.1.4.2 Procedure

As the first step, it is ensured that the teeth are clean and not worn out or damaged. The comb gauge is placed onto the flat specimen surface such that the teeth are normal to the plane of the surface. Sufficient time is allowed for the coating to wet the teeth prior to removing the gauge.

In the case of specimens curved in a single plane, the comb gauge is placed in position parallel to the axis of curvature.

The thickness is measured directly after application since the result can be influenced, for example, by physical drying, curing or solvent loss.

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