
**Paints and varnishes — Evaluation of
properties of coating systems related to
the application process —**

Part 2:

**Colour stability, process hiding power,
re-dissolving, overspray absorption,
wetting, surface texture and mottling**

*Peintures et vernis — Évaluation des propriétés des systèmes de
revêtement liées au mode d'application —*

*Partie 2. Stabilité des couleurs, pouvoir masquant du procédé,
détrempe, absorption des pertes de peinture à la pulvérisation,
mouillage, texture superficielle et marbrures*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 28199-2 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

ISO 28199 consists of the following parts, under the general title *Paints and varnishes — Evaluation of properties of coating systems related to the application process*:

- *Part 1: Relevant vocabulary and preparation of test panels*
- *Part 2: Colour stability, process hiding power, re-dissolving, overspray absorption, wetting, surface texture and mottling*
- *Part 3: Visual assessment of sagging, formation of bubbles, pinholing and hiding power*

Introduction

In many areas (e.g. car manufacture, industrial coatings, coatings for plastics) the coating materials used are adapted to the specific application equipment and technologies of the particular user. A coating material is, therefore, understood to be a semi-manufactured product that only receives its final form in combination with the specific application conditions. The adaptation to the application conditions is therefore decisive for the quality of the coated product.

The test methods specified in ISO 28199 are based on studies by a Working Group of the European Council for Automotive R&D (EUCAR).

They may be used for evaluation of coating materials in research, development and production with regard to their suitability and safety for industrial processes, and error analysis. The properties of coating materials and coatings to be evaluated depend on the film thickness, so a coating system of increasing thickness is applied to a test panel under defined conditions.

The following characteristics are measured (in ISO 28199-1):

- film thickness in accordance with ISO 2808;
- surface texture;
- colour in accordance with ISO 7724 (all parts).

In combination with visual assessment, the following properties are determined:

- colour stability, process hiding power, re-dissolving, overspray absorption, wetting, surface texture and mottling (this part of ISO 28199);
- tendency to sagging, formation of bubbles, pinholing and hiding power (ISO 28199-3).

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Paints and varnishes — Evaluation of properties of coating systems related to the application process —

Part 2:

Colour stability, process hiding power, re-dissolving, overspray absorption, wetting, surface texture and mottling

1 Scope

This part of ISO 28199 specifies methods for the determination of colour stability, process hiding power, re-dissolving, overspray absorption, wetting, surface texture and mottling of coating materials applied to a test panel under defined conditions.

2 Normative references

The following referenced documents are indispensable for the application 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 28199-1:2009, *Paints and varnishes — Evaluation of properties of coatings related to the application process — Part 1: Relevant vocabulary and preparation of test panels*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 28199-1 apply.

4 Colour stability

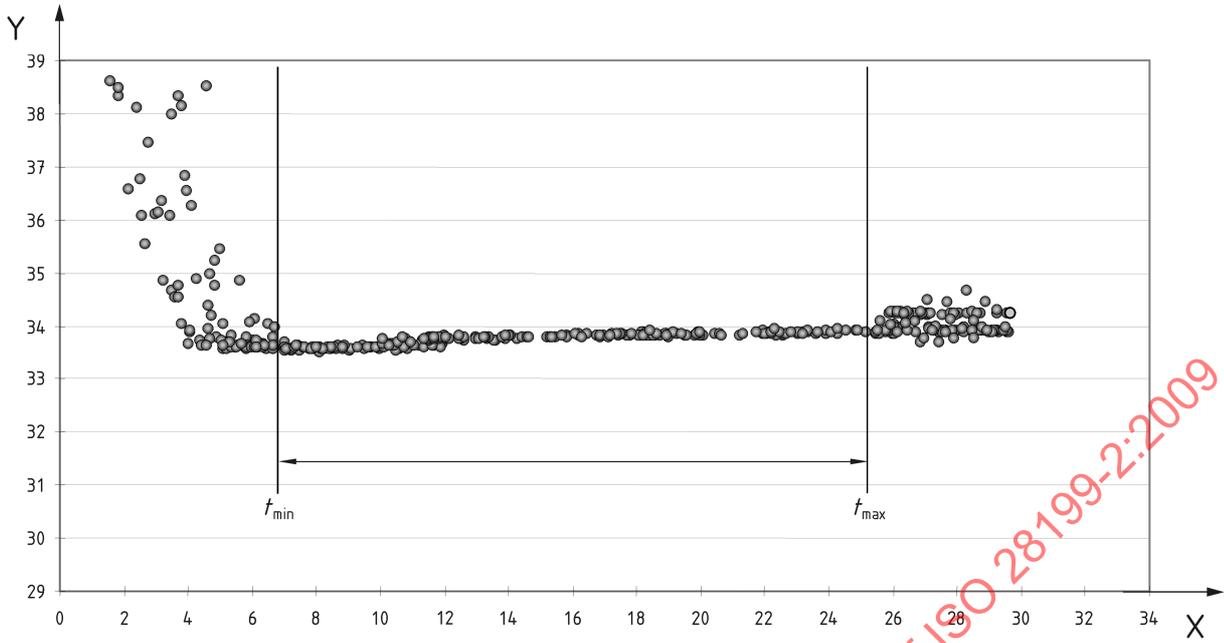
4.1 General

Colour stability is determined by evaluation of the values measured for a wedge-shaped base coat and constant-thickness clear coat, obtained in accordance with 9.4 of ISO 28199-1: 2009.

4.2 Evaluation

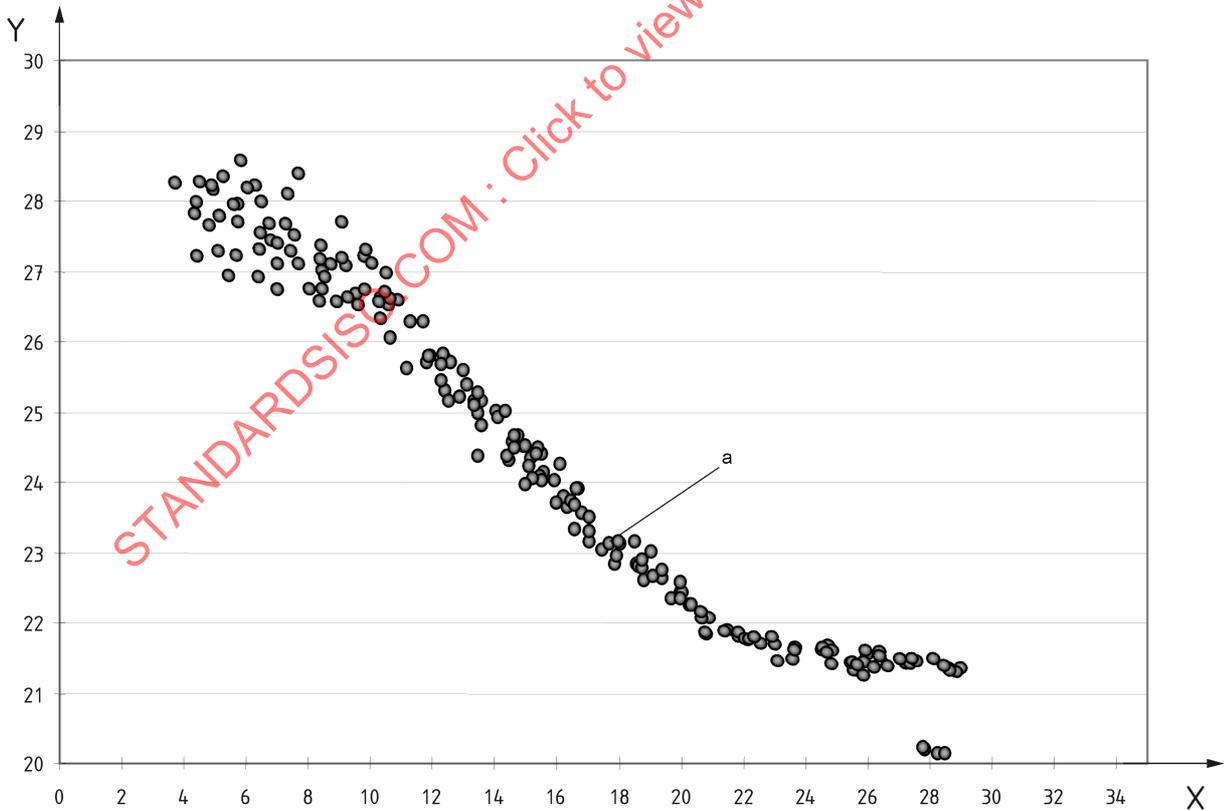
Plot the colour space values determined for the wedge-shaped base coat and constant-thickness clear coat in accordance with ISO 28199-1:2009, 9.4, against the film thickness of the base coat, and evaluate the development of the curve visually. Determine the lowest (t_{\min}) and the highest (t_{\max}) film thicknesses at which the curve is approximately parallel to the X-axis. With regard to parallelism, a tolerance range or a minimum gradient shall be agreed. Figures 1 and 2 showing examples of film thickness plotted against lightness (L^*). The Y-axis can also show the colour values a^* , b^* , C^* and h .

The range of colour stability ends at that film thickness at which the curve is no longer parallel to the X-axis.



Key
 X film thickness (μm)
 Y lightness
 t_{min} start of colour stability
 t_{max} end of colour stability

Figure 1 — Graph showing colour stability (idealized)



Key
 X film thickness (μm) Y lightness
^a Evidence of drift in the colour values of the base coat, i.e. lack of colour stability.

Figure 2 — Graph showing lack of colour stability

5 Process hiding power

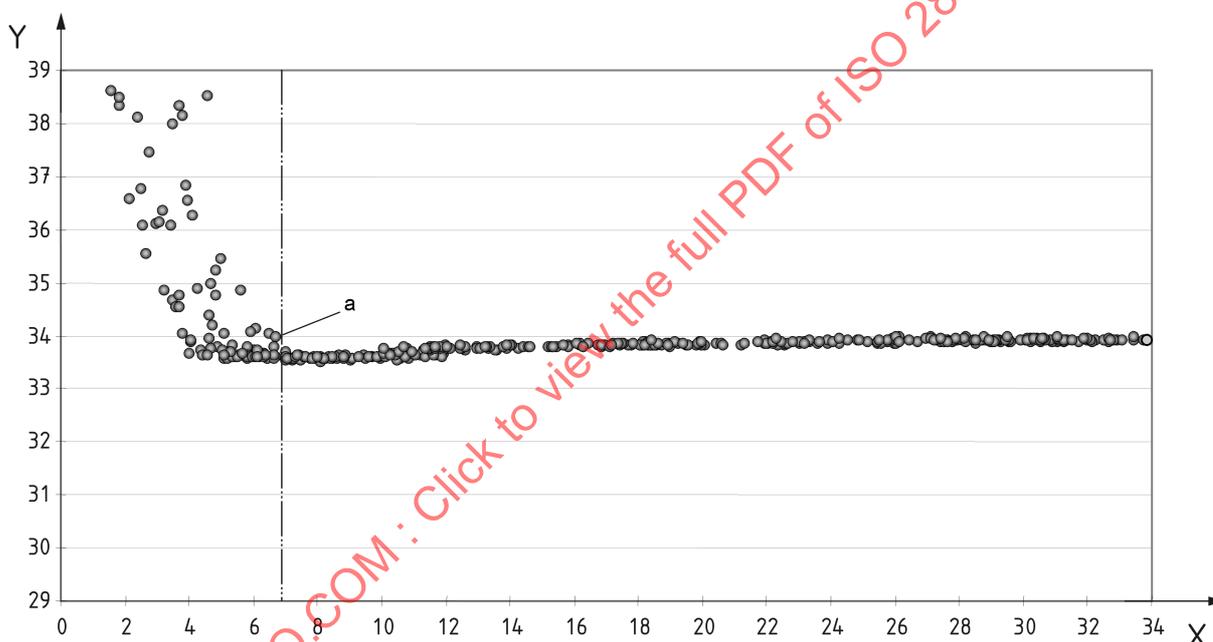
5.1 General

The process hiding power is determined by evaluation of the values measured for the process substrate, wedge-shaped base coat and constant-thickness clear coat, obtained in accordance with 9.4 of ISO 28199-1:2009. The lowest film thickness exhibiting colour stability (t_{\min}) (see 4.2) is determined.

5.2 Evaluation

Using the same method for evaluating the colour stability as specified in 4.2, evaluate the values measured for the process substrate, wedge-shaped base coat and constant-thickness clear coat, obtained in accordance with ISO 28199-1. Figure 3 shows an example of film thickness plotted against lightness (L^*).

NOTE Often the development of the curves resembles those for colour stability evaluation, but shifted into other film thickness ranges.



Key

X film thickness (μm)

Y lightness

a Point at which a constant colour value is achieved, i.e. the base coat covers the substrate used.

Figure 3 — Process hiding power

6 Re-dissolving

6.1 General

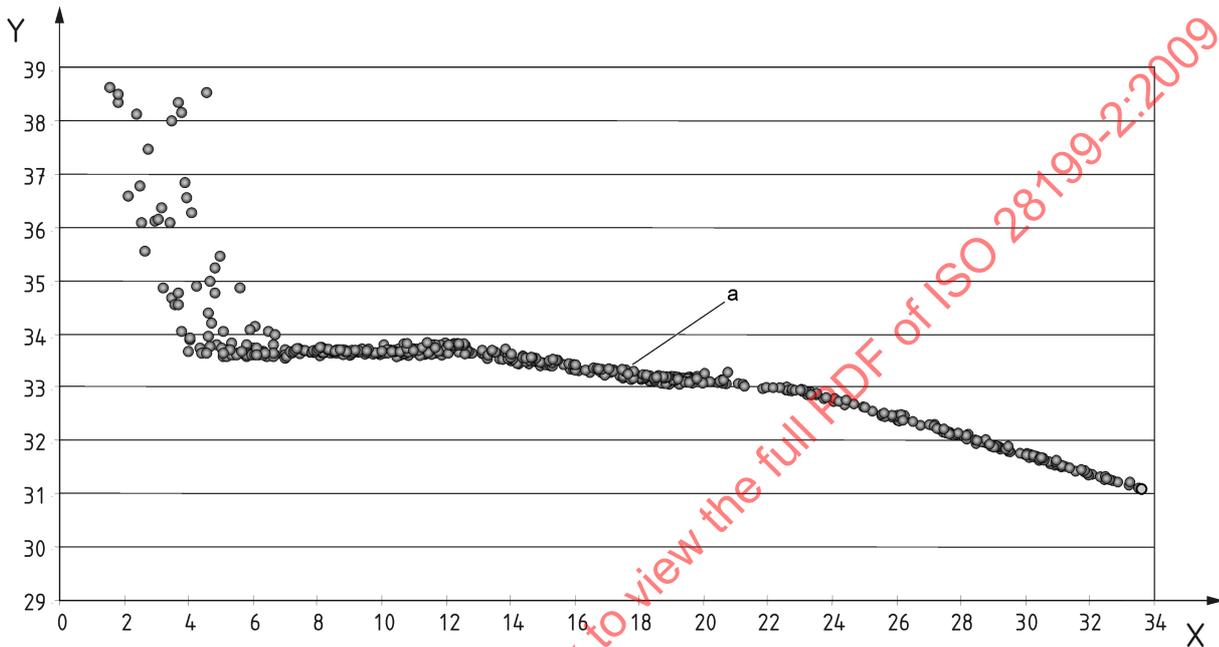
Re-dissolving is determined by evaluation of the values measured for the constant-thickness base coat and wedge-shaped clear coat, obtained in accordance with 9.4 of ISO 28199-1:2009.

For a given drying/application process it is possible that, above a certain film thickness, insufficient solvent escapes. The top layer of the base coat will interact with the solvents of the clear coat, which is applied later. This could lead to another arrangement of, for example, effect pigments, which could result in greater local differences of the colour space values at the same film thickness.

6.2 Evaluation

Plot the colour space values determined for the constant-thickness base coat and wedge-shaped clear coat, obtained in accordance with ISO 28199-1:2009, 9.4, against the film thickness of the clear coat. Evaluate visually the development of the curves obtained, preferably including L^*25° and b^*25° , since the effect is best visible at 25° . Figure 4 shows an example of film thickness plotted against lightness (L^*).

Re-dissolving will be evidenced on the curve because, as film thickness increases, the curve will begin to drift out of the range defined for colour stability (end of the plateau for colour stability). This might be due to self-colouration or yellowing of the clear coat.



Key

X film thickness (μm)

Y lightness

a Drift in colour values indicates re-dissolving.

Figure 4 — Re-dissolving

7 Overspray absorption

7.1 General

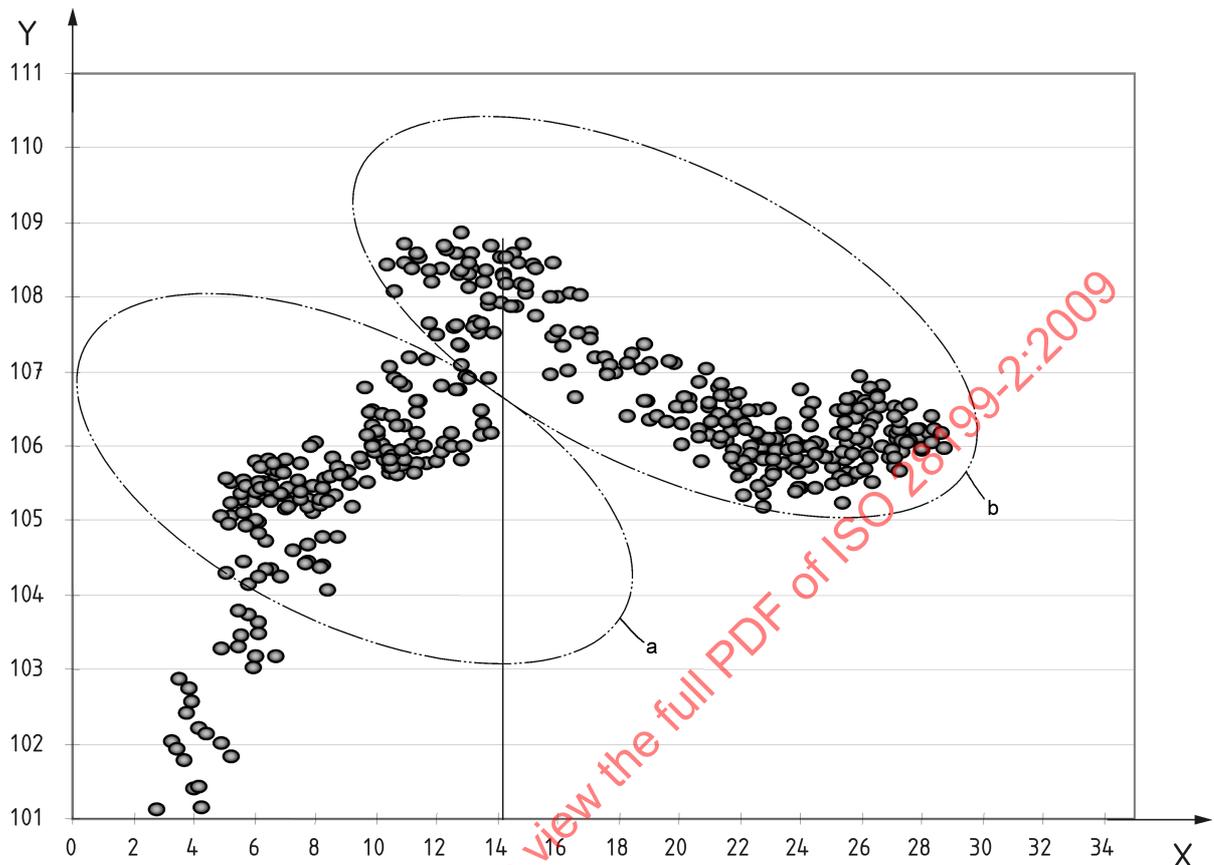
Overspray absorption is determined by evaluation of the values measured for the wedge-shaped base coat and constant-thickness clear coat, obtained in accordance with 9.4 of ISO 28199-1:2009.

7.2 Evaluation

Using the values measured for the wedge-shaped base coat and constant-thickness clear coat, obtained in accordance with ISO 28199-1:2009, 9.4, plot the lightness value L^*25° (see ISO 7724 [3], [4], [5]) against the film thickness of the base coat. Figure 5 shows an example of film thickness plotted against lightness (L^*).

Overspray absorption occurs when the first and second spraying stages merge with each other. This results in a steady transition from the plateau of the colour stability to the re-dissolving range (see Figure 5).

Insufficient overspray absorption is characterized by a large number of measured points occurring in at least two areas.



Key

X film thickness (μm)
Y lightness

- a Large number of measured points from first spraying stage.
b Large number of measured points from second spraying stage.

Figure 5 — Insufficient overspray absorption

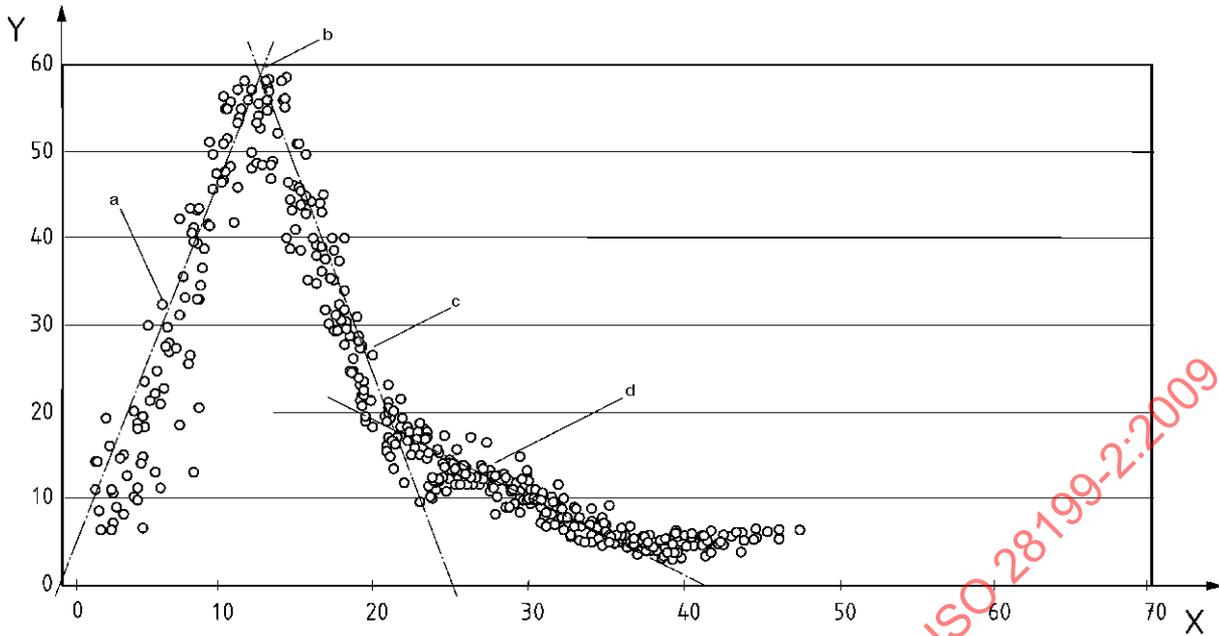
8 Wetting

8.1 General

Wetting is determined by evaluation of the values measured for the constant-thickness base coat and wedge-shaped clear coat, obtained in accordance with 9.4 of ISO 28199-1:2009.

8.2 Evaluation

Using the values measured for the constant-thickness base coat and wedge-shaped clear coat, obtained in accordance with ISO 28199-1:2009, 9.4, plot the values for the long-wavelength range against the film thickness, and determine the film thickness of the first wetting. Figure 6 shows an example of film thickness plotted against long-wavelength values.



Key

- X film thickness (μm)
- Y long-wavelength values
- a Beginning of wetting.
- b Substrate completely wetted.
- c Beginning of levelling.
- d Coating completely level.

Figure 6 — Wetting

9 Surface texture

9.1 General

The surface texture is determined by evaluation of the values measured for the wedge-shaped coating, obtained in accordance with 9.4.4 of ISO 28199-1:2009.

9.2 Evaluation

9.2.1 General evaluation

Using the values measured for the wedge-shaped coating, obtained in accordance with ISO 28199-1:2009, 9.4.4, plot the surface texture values against the film thickness. Figures 7 and 8 show examples of film thickness plotted against short-wavelength and long-wavelength values.

9.2.2 Evaluation of base coats

For evaluation of the base coat surface texture, use the short-wavelength values. Take the mean values of the short-wavelength values lying within the range permitted for the paint-application process in question (the so-called process window).

The short-wavelength values (see ISO 28199-1:2009, 3.16) of the base coat within the process window shall not be confused with the short-wavelength values of the clear coat.

The short-wavelength values of reference strip 2 (see ISO 28199-1:2009, Figure 2) shall be clearly below the short-wavelength values of the measuring range.