INTERNATIONAL STANDARD

ISO 8130-10

Second edition
2021-06

Coating powders —

Part 10: Determination of deposition efficiency

Poudres pour revêtement —

Partie 10: Détermination du rendement d'application

Reference number
ISO 8130-10:2021(E)

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Published in Switzerland

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Foreword

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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).

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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 vanishes*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 139, *Paints and varnishes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 8130-10:1998), which has been technically revised. The main changes compared to the previous edition are as follows:

— the test report has been modified;

— the precision data have been deleted;

— the text has been editorially revised and the normative references have been updated.

A list of all parts in the ISO 8130 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

Coating powders —

Part 10: Determination of deposition efficiency

1 Scope

This document specifies a method for determining the mass fraction in per cent (%) of a sprayed coating powder which is deposited on a test item under known spray gun and environmental conditions.

The method is applicable to powders applied by corona or tribo charging and can be used to compare the deposition efficiency of different powders with the same or different gun with the same powder.

This method is only used for comparison when powders or guns are evaluated consecutively, as the influence of the environment and the equipment can vary significantly with time and location.

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 8130-14, *Coating powders — Part 14: Vocabulary*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8130-14 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 https://www.electropedia.org/

3.1
deposition efficiency
proportion of the mass of powder deposited compared to the mass of powder sprayed, expressed as a mass fraction in per cent

4 Principle

The method consists of spraying charged powder, at a known flow rate and under known conditions of temperature and humidity. The powder is sprayed onto five similar steel items each wrapped in an aluminium foil. The mass of powder deposited onto the central item is determined, from which the deposition efficiency is calculated.

The operation is performed in an air extraction booth.

The results are dependent on the following properties of the powder:

a) chemical composition;

b) density;

c) particle size distribution;

d) particle shape;

e) flow properties of its mixture in air;

f) moisture content.

5 Apparatus

Ordinary laboratory apparatus, together with the following.

5.1 Set of test items, consisting of five steel tubes of external diameter 25 mm and length 500 mm. The tubes have a hole drilled at one end to enable the items to be hung vertically. Each item shall be properly earthed.

5.2 Clean aluminium foil, of commercial quality.

5.3 Suspension device, from which the five tubes can be hung vertically in line at equal distances of 95 mm to 105 mm as measured from the centre.

5.4 Vacuum-cleaner bag.

5.5 Oven, capable of melting the powder.

5.6 Balance, accurate to 0,1 g.

5.7 Timing device, accurate to 0,1 s.

5.8 Powder spray system, consisting of either a corona or a tribo charge spray gun suitably mounted in an air extraction booth together with a suitable powder collection device.

5.9 Non-conductive shield or **powder collection device**, sufficiently large to prevent powder emitted from the spray gun from impinging on the items before and after the test, and sufficiently mobile to be moved away for the period of test.

6 Sampling

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

A sample of 2 kg is recommended.

7 Procedure

7.1 Carry out the test in duplicate at a temperature of (23 ± 2) °C and a relative humidity between 20 % and 70 %.

In view of the large volume of air which can pass through the air extraction booth during the test, it may not be possible to control the temperature and humidity. Under these circumstances, the range of temperature and humidity shall be stated in the test report.

7.2 Wrap the five items (5.1) with aluminium foil (5.2) such that the top and bottom edges fold over into the tube to ensure good electrical contact. Weigh, on the balance (5.6) to the nearest 0,1 g, the foil to be used for the central tube.

7.3 Determine the powder flow rate by spraying powder through the powder spray system (5.8) for 60 s as measured by the timing device (5.7) into a pre-weighed vacuum-cleaner bag (5.4). Re-weigh the bag and its contents to 0,1 g and calculate the powder flow rate in grams per minute.

a) When using a corona charge gun, adjust the control of the powder spray device to achieve a powder flow rate of (150 ± 7,5) g/min.

   It is essential that the high voltage is turned off during this operation.

b) When using a tribo charge gun, adjust the delivery air pressure to 300 kPa and measure the powder flow rate as described in the first paragraph of 7.3.

7.4 Place the suspension device (5.3) with the five tubes in the spray booth.

7.5 Mount and level the spray gun in the extraction booth so that it is aimed at the middle of the central tube at a distance such that the powder will cover approximately 60 % of the length of the central tube. Record this distance. Ensure the air flow across the booth opening is set between 0,4 m/s and 1,0 m/s and the air flows parallel to the spraying direction.

It may be difficult to cover 60 % of the target length when narrow cone applicators are used. Any deviation shall be recorded in the test report.

7.6 Place the shield (5.9) between the spray gun and the items.

7.7 Turn on the powder flow and, in the case of the corona charge gun, adjust the potential so that the true gun potential is (60 ± 1) kV at the appropriate polarity.

NOTE The opportunity can be taken at this point to conduct the test at different voltages to enable a more in-depth evaluation of the equipment and the powder.

7.8 Remove the shield and allow the powder to spray steadily, without surging, onto the items for (6,0 ± 0,5) s. At the end of this period, immediately replace the shield between the spray gun and the targets. Turn off the spray gun.

7.9 Carefully remove the central target from the suspension device to avoid powder loss from the sprayed items. Place in the oven (5.5) set to a temperature so that the powder coating melts within 5 min to 10 min.

Do not subject the powder coating to the curing process since this could result in losses.

7.10 Remove the tube and foil from the oven and allow to cool. Remove the foil from the tube and weigh to the nearest 0,1 g.

NOTE To prevent powder losses, the foil can be removed inside a pre-weighed plastic bag.

8 Expression of results

8.1 Calculate the deposition efficiency, E, expressed as a mass fraction in per cent, using Formula (1):

$$E = \frac{m_p \times 60 \times 100}{P_f \times t} \quad (1)$$

where

m_p is the mass of powder deposited on the foil, in grams;

t is the spray time, in seconds;

P_f is the powder flow rate, in grams per minute.

8.2 Calculate and report the arithmetical mean of two results differing by less than 5 %. Difference exceeding 5 %, then carry out a third determination and report the arithmetical mean of all three results. Determination of the third result and the mean of the other determinations is also greater than 5 %, state this and the individual results in the test report.

Express the results to one decimal place.

9 Precision

Precision data are currently not available.

10 Test report

The test report shall contain at least the following information:

a) a reference to this document, i.e. ISO 8130-10:2021;

b) all details necessary to identify the product tested, including:

   1) the type of powder;

   2) the particle size distribution;

   3) the density of the powder tested;

   4) chemical composition;

   5) particle shape (if available);

   6) flow properties;

c) all details on the test conditions, including:

   1) spray pattern produced by the gun;

   2) gun air pressure;

   3) gun voltage;

   4) gun polarity;

5) air humidity;

d) a full description of the spraying apparatus, including:

1) for a corona charge gun, the true gun voltage or voltages (see note to 7.7) and the polarity used;

2) for a tribo gun, the powder delivery air pressure;

3) a description of the spray nozzle;

4) the powder flow rate;

e) the distance between the target and the gun nozzle;

f) the air flow rate across the booth opening;

g) the atmospheric temperature and relative humidity of the air delivered to the extraction booth (see 7.1);

h) the results of the test as indicated in 8.2;

i) any deviation from the test method specified;

j) any unusual features (anomalies) observed during the test;

k) the date of the test.

ICS 87.040

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