INTERNATIONAL STANDARD

ISO 8130-10

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Coating powders —

Part 10:
Determination of deposition efficiency

Poudres pour revêtement —

Partie 10: Détermination du rendement d'application

Reference number
ISO 8130-10:1998(E)

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.

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.

International Standard ISO 8130-10 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

ISO 8130 consists of the following parts, under the general title *Coating powders*:

— *Part 1: Determination of particle size distribution by sieving*

— *Part 2: Determination of density by gas comparison pyknometer (referee method)*

— *Part 3: Determination of density by liquid displacement pyknometer*

— *Part 4: Calculation of lower explosion limit*

— *Part 5: Determination of flow properties of a powder/air mixture*

— *Part 6: Determination of gel time of thermosetting coating powders at a given temperature*

— *Part 7: Determination of loss of mass on stoving*

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— *Part 8: Assessment of the storage stability of thermosetting powders*

— *Part 9: Sampling*

— *Part 10: Determination of deposition efficiency*

— *Part 11: Inclined-plane flow test*

— *Part 12: Determination of compatibility*

Coating powders –

Part 10:
Determination of deposition efficiency

1 Scope

This part of ISO 8130 is one of a series of standards dealing with the sampling and testing of paints, varnishes and related products.

It specifies a method for determining the percentage by mass of a sprayed coating powder which is actually deposited on a standard test target when powder is sprayed at the target from a spray gun under standard conditions.

The method is applicable to powders applied by corona charging or tribo charging.

The method may be used to compare the deposition efficiency of different powders with the same gun or of different guns with the same powder.

This method should only be 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.

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;

and also on the test conditions, including:

g) spray pattern produced by the gun;

h) gun air pressure;

i) gun voltage;

j) gun polarity;

k) air humidity.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 8130. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8130 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members IEC and ISO maintain registers of currently valid International Standards.

ISO 8130-9:1992, *Coating powders – Part 9: Sampling.*

3 Definitions

For the purposes of this part of ISO 8130, the following definition applies:

3.1 deposition efficiency: The proportion of the mass of powder deposited compared to the mass of powder sprayed, expressed as a percentage.

4 Principle

The method consists of spraying charged powder, at a known flow rate and under known conditions of atmospheric temperature and humidity, at the central one of five similar steel targets each wrapped in aluminium foil. The mass of powder deposited on the central target is determined, from which the deposition efficiency is calculated.

The operation is performed in an air extraction booth.

5 Apparatus

5.1 Set of targets, 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 targets to be hung vertically. Each target shall be properly earthed.

5.2 Clean aluminium foil, of commercial quality.

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

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 charge 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 targets 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 8130-9. 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 to close limits. Under these circumstances, the range of temperature and humidity shall be stated in the test report.

7.2 Wrap the five targets (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.

NOTE – 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 (= 3 bar) 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 target 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 that it 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 targets.

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 judgement of the equipment and the powder to be made.

7.8 Remove the shield and allow the powder to spray steadily, without surging, onto the targets 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 Remove the central target from the suspension device carefully so as not to knock off any powder. Place in the oven (5.5) set to a temperature so that the powder coating melts within 5 minutes to 10 minutes.

Do not subject the powder coating to the curing process as 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 percentage by mass, using the following equation:

$$E = \frac{m_p \times 60 \times 100}{Pf \times t}$$

where

m_p is the mass of powder deposited on the foil, in grams;
t is the spray time, in seconds;
Pf is the powder flow rate, in grams per minute.

8.2 If the two results differ by not more than 5 % of the lower value, calculate and report the arithmetical mean. If the difference exceeds 5 %, carry out a third determination and report the arithmetical mean of all three results.

If the difference between the result of the third determination 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

Experience shows that the powder flow rate may be determined with a precision of ±3 %.

The deposition efficiency with both corona charge and tribo charge guns may be determined with a precision of ±5 %.

10 Test report

The test report shall contain at least the following information:

a) all details necessary to identify the product tested;

b) a reference to this part of ISO 8130 (ISO 8130-10);

c) the type of powder;

d) the particle size distribution (if available);

e) the density of the powder tested (if available);

f) 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;

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

h) the air flow rate across the booth opening;

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

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

k) any deviation from the test method specified;

l) the date of the test.

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Descriptors: paints, coatings, powdery materials, spraying, tests, determination, efficiency.

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