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**Coating powders —**

**Part 15:  
Rheology**

*Poudres pour revêtement —*

*Partie 15: Rhéologie*

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## ISO 8130-15:2023(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.

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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://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 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](http://www.iso.org/members.html).

## Introduction

The powder coating process is dependent on several material variables, whose presence within the powder mixture is critical for ensuring smooth operation. A precise understanding of the fluidization behaviour is important for optimal processing parameters in the fluidized bed, during pneumatic conveyance and the spraying process. In addition, understanding the long-term stability during storage or behavioural change during processing can also help to improve the reuse of powder coatings. Furthermore, melt rheology is introduced to understand the melt flow properties of a given powder coating system, to provide information after spraying, on the powder melt viscosity and gel point. The methods in this document can be used for quality-control and detailed studies.

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# Coating powders —

## Part 15: Rheology

### 1 Scope

This document specifies methods for the determination of the rheological behaviour of a coating powder both in particulate and molten form.

### 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 3219-1, *Rheology — Part 1: Vocabulary and symbols for rotational and oscillatory rheometry*

ISO 3219-2, *Rheology — Part 2: General principles of rotational and oscillatory rheometry*

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 3219-1, ISO 8130-14 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

##### **apparent viscosity**

flow resistance of the fluidized powder bed

### 4 Principle

#### 4.1 Powder

The different fluidization properties are determined in a rheometer. In addition to rotational speed and torque, the airflow rate through the powder bed can be precisely controlled and the pressure drop determined. This allows complete analysis of all fluidization parameters that influence the powder coating process.

#### 4.2 Melt

In order to characterize the powder in its molten form, a rheometer in accordance with ISO 3219-2 shall be used to determine the melt and polymerization properties.

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### 5 Apparatus

Use ordinary laboratory apparatus, together with the following.

**5.1 Rheometer**, in accordance with ISO 3219-2, equipped with a cylindrical measurement cell with a minimum diameter of 50 mm and a minimum height of 100 mm, ideally transparent and coated with conductive material to prevent electrostatic charging to maintain visibility. As a measurement system, a rectangular stirrer of minimum of 10 mm × 30 mm measurement surface is recommended unless otherwise specified.

For particulate measurements, a mass flow controller capable of generating an airflow from 0,05 l/min to at least 5 l/min is connected to ensure a uniform fluidization. A pressure transducer is required if pressure drop measurements shall be gathered.

For molten measurements, a disposable plate-plate geometry in a rheometer according to ISO 3219-2 with a heated plate and hood is advised.

#### 5.2 Measurement geometry

For fluidization, deaeration and apparent viscosity measurements, use a profiled cylinder. Alternatively, measure in an undisturbed bed, without any measurement system inserted.

For cohesion strength measurements, a rectangular stirrer with a minimum measurement surface of 10 mm × 30 mm is recommended.

Use of a disposable plate of at least 25 mm diameter is advised in molten measurements.

NOTE A plate of smaller diameter can give spurious results.

### 6 Sampling

Take a representative sample of the product under test as specified in ISO 15528.

A minimum sample volume for powder particulate rheology measurements of 80 ml is recommended.

For further measurements of the same powder, it is recommended to keep a consistent mass.

For melt rheology measurement, it is advised to fill the plate-plate gap with the excess particulate powder, e.g. × 15 the volume, and then compress it prior to melting.

### 7 Experimental

#### 7.1 Powder measurements

##### 7.1.1 Fluidization measurements

Carry out the fluidization measurement using the profiled cylinder and perform it in two modes, i.e. unstirred and stirred, e.g. rotational speed 8 min<sup>-1</sup>. First, decrease the air flow from 5 l/min to 0 l/min continuously, within a minimum of 30 s and then increase again from 0 l/min to 5 l/min.

This measurement is carried out to find the volumetric flow rate i.e. the volume of gas per time necessary for subsequent testing, as well as the volumetric flow rates for incipient and full fluidization of the sample.

NOTE For explanations of transitions such as incipient and full fluidization, see [A.1](#).

The measurements shall be performed first unstirred, then stirred.