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Paints and varnishes — Determination of viscosity using rotational viscometers —

Part 1: Absolute viscosity measurement with cone-plate measuring geometry at high shear rates

Peintures et vernis — Détermination de la viscosité au moyen de viscosimètres rotatifs —
Partie 1: Mesurage de la viscosité absolue par géométrie de mesure cône/plateau à des vitesses de cisaillement élevées

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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 document 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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This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes,* 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 2884-1:1999), which has been technically revised.

The main changes are as follows:

— terminology and symbols have been adapted to ISO 3219-1;

— when describing the measuring assembly, the current state of the art was taken into account and adapted to ISO 3219-2;

— reference to alternative measuring geometries has been added to Clause 7;

— description of the test procedure including the test report has been updated;

— the normative references have been updated.

A list of all parts in the ISO 2884 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.

Paints and varnishes — Determination of viscosity using rotational viscometers —

Part 1: Absolute viscosity measurement with cone-plate measuring geometry at high shear rates

1 Scope

This document specifies the general procedure to be followed in determining the dynamic viscosity of unpigmented coating materials, such as paints, varnishes and related products, as well as binders at a shear rate range between 9 000 s^{-1} and 12 000 s^{-1}. It describes an absolute viscosity measurement with cone-plate measuring geometry at high shear rates.

The measured value gives information about the resistance offered by the material to brushing, spraying and roller coating during application.

The method specified in this document is suitable for all paints and varnishes whether they are Newtonian in behaviour or not. For materials containing dispersions of large particles, the measuring geometry is expected to be adapted.

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 1513, *Paints and varnishes — Examination and preparation of test samples*

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 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 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/

4 Measuring assembly

The measuring assembly consists of a rotational viscometer with a cone-plate measuring geometry that covers the shear rate range between 9 000 s^{-1} and 12 000 s^{-1}. Details about the measuring assembly shall be indicated in the test report (see Clause 9). A cone-plate measuring geometry is described in Annex A.

5 Sampling

Take a representative sample of the product to be tested, as specified in ISO 15528. Then examine the sample and prepare it for testing, as specified in ISO 1513.

Samples without particles should be used for application of this document. Samples containing particles lead to anomalous results and can cause damage to the measuring geometry. When using samples with particles, a cone-plate measuring geometry with a flattened cone tip shall be used. The maximum size of heterogeneous components should not exceed 10 % of the gap width of the removed cone tip.

6 Checking the measuring assembly

The measuring system and temperature control system used shall be adjusted, calibrated and verified. Inspect the cones regularly for wear and replace them as required.

Regularly check the measuring assembly, consisting of measuring device, measuring geometry and temperature control system, in accordance with the recommendations of the manufacturer and using a reference fluid. If the viscosity value measured in this way deviates by more than ±5 % from the setpoint value, then the measuring assembly shall be checked.

Mineral oils (no silicone oils) shall be used as the reference fluid.

7 Procedure

7.1 The ambient conditions under which the rotational viscometer is operated shall meet the requirements of the device manufacturer. The measuring device should be placed in a climate-controlled room [temperature: (23 ± 2) °C, relative humidity: (50 ± 5) %].

Following the sequences stated in 7.2 to 7.5, carry out the test in duplicate immediately after preparation of the sample in accordance with Clause 5.

If not otherwise agreed, perform the determination at (23 ± 0,2) °C and state the temperature in the test report.

7.2 Adjust the temperature of the rotational viscometer to (23 ± 0,2) °C or to an alternative agreed temperature. Apply a suitable amount of the coating material under testing to the lower plate of the measuring geometry, taking care to avoid the inclusion of air bubbles. Trim the sample and bring it to a thermal equilibrium.

7.3 The measuring profile is defined through preliminary tests. Potential measuring errors such as emptying of the gap can be avoided by choosing a cone-plate geometry with a different diameter or a different cone angle.

7.4 Carry out the measurement and document the results in the test report (see Clause 9).

7.5 After every measurement, clean the measuring geometry with a suitable solvent.

8 Repeatability and measuring error

Starting from an adjusted and calibrated measuring assembly, the results of two viscosity determinations performed within a short period of time, one after the other in the same laboratory by the same operator, shall not deviate by more than ±5 % from the mean value of the two measurements.

In the event of emptying of the gap, the measuring geometry used should be checked and, if necessary, replaced with a cone having a smaller diameter. If this measure is not sufficient to prevent emptying of the gap, then a coaxial-cylinders measuring geometry as specified in ISO 3219-2 shall be used.

Further measuring errors such as solvent loss or structural changes to the sample shall be avoided.