INTERNATIONAL STANDARD ISO 2884

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Paints and varnishes — Determination of viscosity at a high rate of shear

Peintures et vernis — Détermination de la viscosité des peintures à gradient de vitesse élevé

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FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2884 was drawn up by Technical Committee ISO/TC 35, *Paints and varnishes*, and circulated to the Member Bodies in July 1972.

It has been approved by the Member Bodies of the following countries :

Australia	India	South Africa, Rep. of
Brazil	Iran	Sweden
Canada	Ireland	Switzerland
Czechoslovakia	Israel	Thailand
Denmark	New Zealand	Turkey
Egypt, Arab Rep. of	Poland	United Kingdom
France	Portugal	U.S.A.
Germany	Romania	U.S.S.R.

The Member Body of the following country expressed disapproval of the document on technical grounds :

Italy

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Paints and varnishes — Determination of viscosity at a high rate of shear

0 INTRODUCTION

This International Standard is one of a series dealing with the testing of paints, varnishes and related products. It should be read in conjunction with ISO 1512, *Paints and varnishes — Sampling,* ISO 1513, *Paints and varnishes — Examination and preparation of samples for testing* and ISO 1524, *Paints and varnishes — Determination of fineness of grind.*

It supplements ISO 2431, *Paints and varnishes — Determination of flow time by use of a flow cup.*

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the general procedure to be followed in determining the dynamic viscosity of paints, varnishes and related products at a rate of shear not less than 5 000 s^{-1} and not higher than 20 000 s^{-1}. When the viscosities of products are being compared the rate of shear shall be approximately the same. The determination shall be made at a closely controlled temperature, 23 ± 0,2 °C unless otherwise agreed.

The value obtained gives information about the resistance of the material to brushing during the initial application period; no information is obtained, however, on the changes resulting from evaporation of solvents from the paint.

The method specified in this International Standard is suitable for all brushing paints and varnishes whether they are Newtonian in behaviour or not. Furthermore, because of the narrow gap between the stationary and rotary parts of high shear viscometers, the method is more reproducible for paints having low values for fineness of grind, as determined by ISO 1524.

2 APPARATUS

Viscometer of the cone and plate or concentric cylinder type, working at a rate of shear in the range of 5 000 to 20 000 s^{-1}. The description of the actual apparatus used shall be agreed between the interested parties, and the details given in the test report.

3 SAMPLING

A representative sample of the product to be tested shall be taken as described in ISO 1512. The sample shall then be examined and prepared for testing as described in ISO 1513. The sample shall in all cases be strained through a sieve of nominal aperture size 125 μm into a clean container. The volume of the sample shall be sufficient to fill the viscometer.

4 CHECKING OF THE APPARATUS

Check the apparatus daily when in regular use, or otherwise before use, by carrying out the test as outlined in 6.1 using standard refined mineral oils having Newtonian characteristics and known viscosities[1]. If the readings obtained differ from the known viscosities of the standard oils by more than 5 %, the apparatus should be checked by a competent instrument engineer or returned to the maker for adjustment.

5 CHECKING OF TEMPERATURE CONTROL

It is important that the temperature does not change during the determination. In order to check the temperature control, carry out the test as outlined in 6.1 with the standard refined mineral oil of the highest viscosity. Allow the viscometer to run with this oil for 5 min, after which the reading shall not have decreased by more than 10 %. If the decrease is more than 10 %, the apparatus is unsuitable for the determination of viscosities at high rates of shear in accordance with this International Standard.

1) It is convenient to use three mineral oils with viscosities certified by an approved laboratory and lying between 0,05 and 0,5 N·s/m^2 (50 and 500 cP).

6 PROCEDURE

6.1 Cone and plate or concentric cylinder viscometers

The following sequence of operations shall be carried out in duplicate immediately after the preparation of the sample according to clause 3.

6.1.1 Adjust the temperature of the stationary part of the viscometer (stator or plate)[1] to 23 ± 0,2 °C or to an alternatively agreed temperature. Transfer a suitable amount of the product to be tested to the appropriate part of the viscometer, taking care to avoid the inclusion of air bubbles, and adjust the other part to the correct position. Wait for the prescribed time[1] to allow the sample to attain the agreed temperature.

6.1.2 Start the rotor and record the reading on the scale[2] when the pointer becomes steady.

NOTE — In some cases it is difficult to judge whether a constant reading has been obtained. However, if the pointer does not become steady after 15 s, the reading at 15 s shall be recorded and the lack of a constant reading shall be mentioned in the test report. If highly accurate readings are required, the readings shall be made above the first 10 % of the scale.

6.1.3 If the reading does not directly indicate the viscosity[1], multiply the reading by the appropriate conversion factor or use the appropriate calibration curve to obtain the viscosity.

6.2 Immersion viscometers[3]

If an immersion viscometer is used, transfer the product to a suitable container and bring it to a temperature of 23 ± 0,2 °C or to an alternatively agreed temperature. Then immerse the appropriate part of the viscometer in the product, after which carry out the determination of the viscosity according to the instructions of the manufacturer of the viscometer used.

7 CLEANING OF APPARATUS

Clean the stator and rotor carefully after each test employing a suitable solvent. The procedure to be used will depend on the apparatus, but care shall be taken to remove all of the test material and cleaning solvent. Cleaning utensils which may damage the apparatus shall not be used. Metal cleaning tools must never be used.

8 PRECISION

8.1 Repeatability

The results of two determinations with the same apparatus, taken shortly after one other in the same laboratory by the same operator shall not differ by more than 5 % of their mean.

9 TEST REPORT

The test report shall include the following particulars :

a) a reference to this International Standard or a corresponding national standard;

b) type and identification of the product under test;

c) type of apparatus used.

For a cone and plate viscometer :

d) angle of cone;

e) diameter of cone.

For a concentric cylinder viscometer;

f) outer diameter of gap;

g) inner diameter of gap.

For all tests :

h) rate of shear at which the determination was made (in reciprocal seconds);

i) temperature at which the determination was made;

j) the test results in N·s/m^2*;

k) any deviation, by agreement or otherwise, from the test procedure described;

l) date of the test.

10 LITERATURE

FINK-JENSEN, P.H., and RAASCHOU NIELSEN, H.K., "Assessment of application properties of brushing paints" (report from the Organic Coatings Section, International Union of Pure and Applied Chemistry), *J. Paint Techn.*, vol. 43 (1971) No. 561, pp. 60–67.

1) Depends on the apparatus used.

2) Whether the reading gives a direct indication of the viscosity or not, depends on the apparatus used.

3) That is, viscometers where stator as well as rotor are immersed in the material under test.

* 1 cP = 10^{-3} N·s/m^2.