



Designation: D4889 – 04(Reapproved 2011)

Standard Test Methods for Polyurethane Raw Materials: Determination of Viscosity of Crude or Modified Isocyanates¹

This standard is issued under the fixed designation D4889; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods (A and B) determine the viscosity of crude or modified *isocyanates*. They are applicable to products derived from toluene diisocyanate, methylene-bis-(4-phenylisocyanate), and polymethylene polyphenylisocyanates (see **Note 1**).

NOTE 1—Test method A includes a procedure for measuring dynamic viscosity using a rotational Brookfield instrument. Test method B is simply a reference to a general procedure for measuring kinematic viscosity using a Cannon-Fenske instrument, **D445**.

1.2 The values stated in SI units are to be regarded as standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazards statements see **Warnings** at the end of **5.1** and **10.5**.

NOTE 2—There is no known ISO equivalent to this standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D883 Terminology Relating to Plastics

E1 Specification for ASTM Liquid-in-Glass Thermometers

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods see Terminology **D883**.

¹ These test methods are under the jurisdiction of ASTM Committee **D20** on Plastics and are the direct responsibility of Subcommittee **D20.22** on Cellular Materials - Plastics and Elastomers.

Current edition approved Feb. 1, 2011. Published March 2011. Originally approved in 1988. Last previous edition approved in 2004 as D4889 - 04. DOI: 10.1520/D4889-04R11.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

4. Significance and Use

4.1 These test methods can be used for research or for quality control to characterize *isocyanates* used in polyurethane products.

4.2 Viscosity measures the resistance of a fluid to uniform continuous flow without turbulence or other forces.

4.3 Some isocyanates exhibit non-Newtonian behavior under certain conditions. Whenever possible, generate results for comparison under the same conditions, that is, the same spindle/speed combination for Brookfield viscosity and the same tube size for Cannon-Fenske viscosity.

5. Sampling

5.1 Since organic *isocyanates* react with atmospheric moisture, special precautions must be taken in sampling (see **Warning** at the end of this paragraph). Usual sampling methods (for example, sampling an open drum with a thief), even when carried out rapidly, can cause contamination of the sample with insoluble urea. Therefore, the sample must be blanketed with dry air or nitrogen at all times. (**Warning**—Organic *isocyanates* are harmful when they are absorbed through the skin, or when the vapors are breathed. Provide adequate ventilation and protective gloves and wear eyeglasses.)

6. Test Conditions

6.1 Since isocyanates react with moisture, keep laboratory humidity low, preferably about 50 % relative humidity.

TEST METHOD A—BROOKFIELD VISCOSITY

7. Summary of Test Method

7.1 The viscosity is measured at $25 \pm 0.3^\circ\text{C}$ with a Brookfield viscometer, either Model LVF, LVT, RVF, or RVT.³

8. Interferences

8.1 The temperature and container size are important factors in measuring Brookfield viscosity accurately. Deviation from the prescribed conditions will affect the accuracy of the results.

³ Available from Brookfield Engineering Laboratories, 240 Cushing St., Stoughton, MA 02072.