



Designation: D4016 – 14

Standard Test Method for Viscosity and Gel Time of Chemical Grouts by Rotational Viscometer (Laboratory Method)¹

This standard is issued under the fixed designation D4016; 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 This test method covers the determination of viscosity of catalyzed chemical grouts with a rotational viscometer (laboratory method), over the range from 1.0 mPa·s to 1000 mPa·s (1.0 to 1000 cP).

1.2 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026.

1.2.1 The procedures used to specify how data are collected/recorded or calculated, in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose of obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analysis methods for engineering design.

1.3 The values stated in SI units are the standard. Other units provided in parentheses are for the convenience of the user.

1.4 *This standard does not purport to address all of the safety problems, 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.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.16 on Grouting.

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2. Referenced Documents

2.1 *ASTM Standards*:²

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D6026 Practice for Using Significant Digits in Geotechnical Data

E1 Specification for ASTM Liquid-in-Glass Thermometers

E1142 Terminology Relating to Thermophysical Properties

3. Terminology

3.1 For common definitions of terms used in this standard, refer to Terminologies D653 and E1142.

4. Summary of Test Method

4.1 A rotating spindle is immersed in a container of catalyzed chemical grout. The test specimen viscosity is obtained from the drag on the spindle exerted by the test specimen, and the rotational speed of the spindle.

5. Significance and Use

5.1 This test is intended for materials that will penetrate soil voids and rock fissures. Viscosity alone is not necessarily an exact index of grout penetrability.

6. Apparatus

6.1 *Rotational Viscometer*—The essential instrumentation required providing the minimum rotational viscometer analytical capabilities for this method include:

6.1.1 A *drive motor* to apply a unidirectional rotational displacement to the specimen at a rate from 0.3 revolutions per minute (rev/min) to 60 rev/min constant to within 1 %.

6.1.2 A *force sensor* to measure the torque developed by the specimen.

6.1.3 A *coupling shaft* or other means to transmit the rotational displacement from the motor to the specimen.

6.1.4 A *geometry, spindle, tool or rotational element* to fix the specimen between the drive shaft and a stationary position with a range of 1 mPa·s to 1000 mPa·s.

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.

*A Summary of Changes section appears at the end of this standard