



Designation: D2765 – 16 (Reapproved 2024)

Standard Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics¹

This standard is issued under the fixed designation D2765; 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 The gel content (insoluble fraction) produced in ethylene plastics by crosslinking is determined by extracting with solvents such as decahydronaphthalene or xylenes. The methods described herein are applicable to crosslinked ethylene plastics of all densities, including those containing fillers, and all provide corrections for the inert fillers present in some of those compounds.

1.2 Test Method A, which permits most complete extraction in least time, is to be used for referee tests, but two alternative nonreferee Test Methods B and C are also described. Test Method B differs from the referee test method only in sample preparation; that is, it requires use of shavings taken at selected points in cable insulation, for example, rather than the ground sample required by the referee test method. Because the shaved particles are larger, less total surface per sample is exposed to the extractant, so this test method ordinarily yields extraction values about 1 to 2 % lower than the referee method. Test Method C requires that a specimen in one piece be extracted in xylenes at a constant temperature of 110°C. At this temperature and with a one-piece specimen, even less extraction occurs (from 3 to 9 % less than the referee test method), this method permits swell ratio (a measure of the degree of crosslinking in the gel phase) be determined.

1.3 Extraction tests are made on articles of any shape. They have been particularly useful for electrical insulations since specimens can be selected from those portions of the insulation most susceptible to insufficient crosslinking.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

NOTE 1—This test method is equivalent to ISO 10147, Method B. It is

¹ These test methods are under the jurisdiction of ASTM Committee D20 on Plastics and are the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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not equivalent to ISO 10147 in any other measurement or section.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Sections 6, 9, and 24.

1.6 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D297 Test Methods for Rubber Products—Chemical Analysis

D618 Practice for Conditioning Plastics for Testing

D883 Terminology Relating to Plastics

D1603 Test Method for Carbon Black Content in Olefin Plastics

D1998 Specification for Polyethylene Upright Storage Tanks

D3351 Test Method for Gel Count of Plastic Film (Withdrawn 2000)³

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 *ISO Standard:*

ISO 10147 Pipes and Fittings Made of Crosslinked Polyethylene (Pe-X)—Estimation of the Degree of Crosslinking by Determination of the Gel Content

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

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