



Designation: D3419 – 12

Standard Practice for In-Line Screw-Injection Molding Test Specimens From Thermosetting Compounds¹

This standard is issued under the fixed designation D3419; 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 practice covers the general principles to be followed when injection molding test specimens of thermosetting materials. It is to be used to obtain uniformity in methods of describing the various steps of the injection molding process and in the reporting of those conditions. The exact molding conditions will vary from material to material, and if not incorporated in the material specification, shall be agreed upon between the purchaser and the supplier or determined by previous experience with the particular type of material being used and its plasticity.

NOTE 1—The utility of this practice has been demonstrated for the molding of thermosetting molding compounds exhibiting lower-viscosity non-Newtonian flow.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.3 *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.*

1.4 This practice assumes the use of reciprocating screw injection molding machines.

NOTE 2—This standard and ISO 10724 address the same subject matter, but differ in technical content.

2. Referenced Documents

2.1 *ASTM Standards:*²

D883 Terminology Relating to Plastics

D3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials

¹ This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.09 on Specimen Preparation.

Current edition approved April 1, 2012. Published May 2012. Originally approved in 1975. Last previous edition approved in 2006 as D3419 - 00(2006). DOI: 10.1520/D3419-12.

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.

2.2 *ISO Standards:*³

ISO 10724 :1994(E)—Plastics—Thermosetting Moulding Materials—Injection Moulding of Multipurpose Test Specimens

ISO 3167 :1993, Plastics—Multipurpose Test Specimens

3. Terminology

3.1 *Definitions:*

3.1.1 *General*—Definitions of terms applying to this practice appear in Terminology D883.

3.1.2 *injection molding*—the process of forming a material by forcing it, in a fluid state and under pressure, through a runner system (sprue, runner, and gate(s)) into the cavity of a closed mold.

3.1.2.1 *Discussion*—Screw-injection molding and reaction-injection molding are types of injection molding.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *breathing, v*—the operation of opening a mold or press for a very short period of time at an early stage in the process of cure.

3.2.1.1 *Discussion*—Breathing allows the escape of gas or vapor from the molding material and reduces the tendency of thick moldings to blister.

3.2.2 *cavity (of a mold), n*—the space within a mold to be filled to form the molded product.

3.2.3 *landing (of a cavity), v*—the practice of relieving the mold around the cavity (cavities), thus reducing the surface area of the flat mating surfaces of the mold halves.

3.2.3.1 *Discussion*—Typical lands are 4.5 mm ($\frac{3}{16}$ in.) to 6 mm ($\frac{1}{4}$ in.) in width. It is recommended that landing pads be incorporated to hold the mold open 0.0125 mm (0.0005 in.) to prevent damage to the lands.

4. Significance and Use

4.1 This practice is subject to the definition of injection molding given in 3.1.2 with the further provision that with in-line screw injection the plastic compound, heated in a chamber by conduction and friction, is fluxed by the action of

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

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

a reciprocating screw and then is forced into a hot mold where it solidifies. Hereafter, in-line screw-injection molding will be referred to simply as injection molding.

4.2 The mold referenced in this section (see Fig. 1) is generally useful, and describes what have been the most common specimens required for the testing of thermosets. ISO specimens and testing are gaining favor, however. Practice D3641 and ISO 10724 describe the layout and practice for injection molding the multi-purpose specimens in accordance with ISO 3167.

4.3 Typically, injection-molded test specimens are made with shorter cycles than those used for similar moldings made by compression, and the cycle is equal to or faster than that for transfer molding.

4.4 Breathing of the mold is not usually required to release trapped volatile material as the gas is free to flow from the vent end of the mold. This is particularly advantageous for heat-resistant compounds and reduces the tendency for molded specimens to blister at high exposure temperatures.

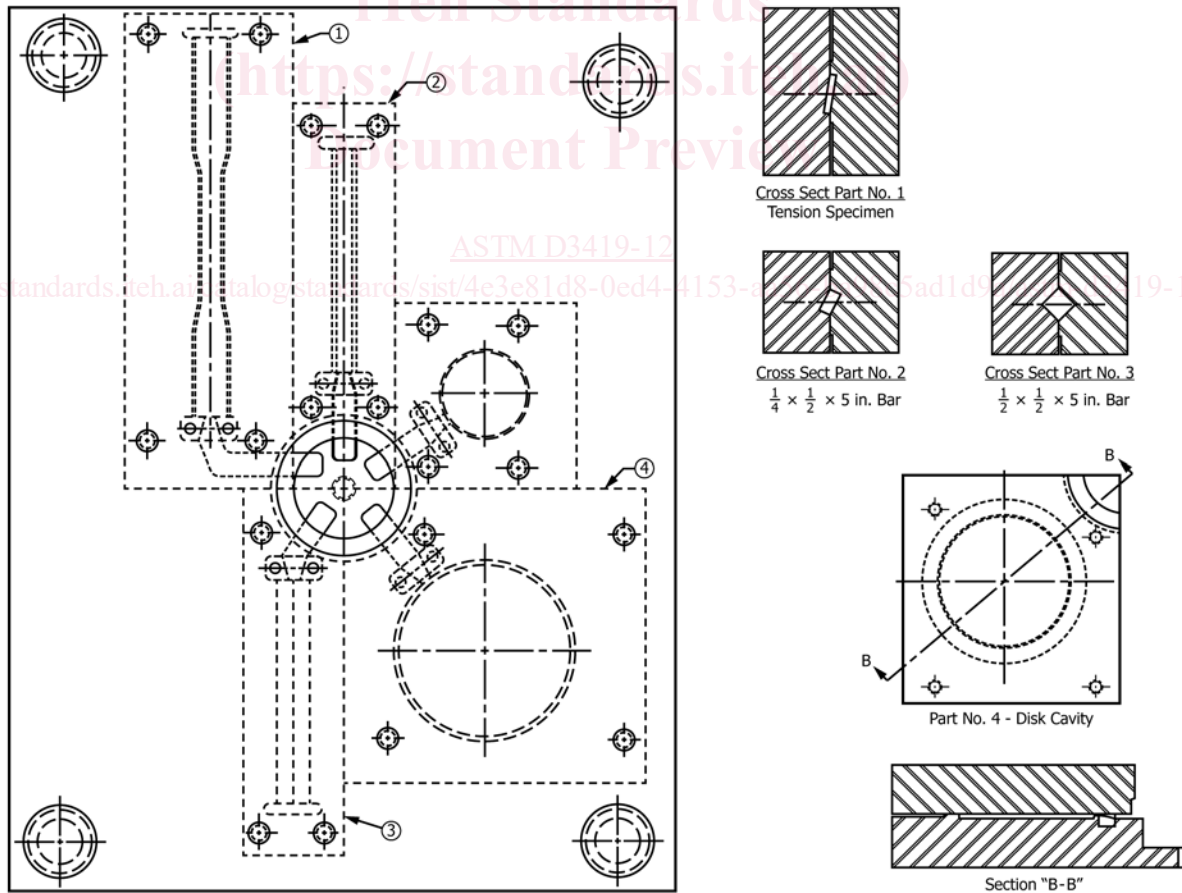
4.5 Injection molding is intended for low-viscosity compounds. One set of processing parameters cannot be specified for all types of thermosetting materials, nor for samples of the same material having different plasticities.

4.6 Materials containing fibrous fillers such as glass roving, chopped cloth, or cellulosic fibers can be injection molded, but their properties will be affected depending upon how much fiber breakdown occurs as the compound is worked by the screw and as it passes through the system of runners and gates. The orientation of the fibers in the molded specimen will also affect injection-molded properties.

4.7 Flow and knit lines in a molded piece are often sites of mechanical or electrical weakness. The fluxed material passing through the gate wrinkles and folds as it proceeds into the mold cavity. Knit lines are found to some degree throughout the molded piece; and can affect test results. Fibers and other reinforcements in the molding compound align with the flow pattern and, generally, are perpendicular to the axis of the bar at its center and parallel at its surface.

4.7.1 Placement and size of gates and vents can be used to minimize flow and knit lines, for example, side gating of bars will minimize the tendency of the material to fold onto itself as the material front proceeds through the length of the mold.

4.8 The Izod impact strength of injection-molded specimens containing short fibers will generally be lower than the values obtained using compression molding methods. The impact



NOTE 1—Thermometer wells shall be 8 mm (5/16 in.) in diameter to permit use of a readily available thermometer.
FIG. 1 Five-Cavity Transfer Mold for Thermosetting Plastic Test Specimens (Steam Cores Not Shown)