



Designation: D5224 – 12 (Reapproved 2019)

Standard Practice for Compression Molding Test Specimens of Thermosetting Molding Compounds¹

This standard is issued under the fixed designation D5224; 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 compression molding test specimens of thermosetting molding compounds, such as phenolics, aminoplastics, melamine phenolics, epoxies, and unsaturated polyesters.

1.2 Molding conditions are given for amino, phenolic, and allyl molding compounds. 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

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

1.4 *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.*

NOTE 1—This standard and ISO 295 address the same subject matter, but differ in technical content.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D638 Test Method for Tensile Properties of Plastics

D883 Terminology Relating to Plastics

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 May 1, 2019. Published June 2019. Originally approved in 1992. Last previous edition approved in 2012 as D5224 - 12. DOI: 10.1520/D5224-12R19.

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 Standard:*

ISO 295 Plastics—Compression Molding Test Specimens of Thermosetting Materials³

ISO 3167 Plastics—Multipurpose—Test Specimens³

3. Terminology

3.1 *Definitions*—For definitions of terms pertaining to plastics used in this practice, see Terminology D883.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *breathe step, n*—in plastics molding, the part of the molding cycle in which the mold halves are opened momentarily, prior to curing, to release volatiles from the molded part.

3.2.2 *skin, n*—in plastics molding, the thin resin-rich layer (skin) on the surface of the molded part.

3.2.3 *skin effect, n*—in plastics testing, the positive or negative effect on the results of some standard tests attributable to the skin.

4. Summary of Practice

4.1 Compression molded test specimens are produced by loading a mold cavity with some form of the molding material, applying a specified pressure to the mating surface for a specified time and at a specified temperature, and then removing the part from the cavity.

5. Significance and Use

5.1 The conditions at which compounds are molded are known to influence the properties of the specimens. The degree of cure, elimination of knit-lines between particles, density of the part, and degradation of the polymer are among those factors which will be affected by the molding conditions. Thus it is important to conform to a standard set of conditions in order to have a valid comparison of properties between different compounds and different batches of the same compound.

³ *ISO Standards Handbook 21*, Vol 2, Plastics, 2nd Ed., 1990, available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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

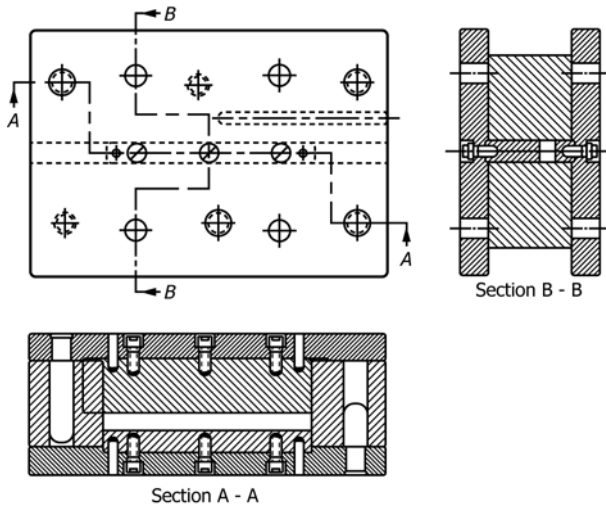


FIG. 1 Single-Cavity Positive-Compression Mold for Bar Test Specimens

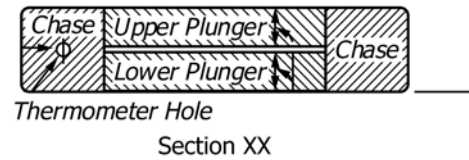
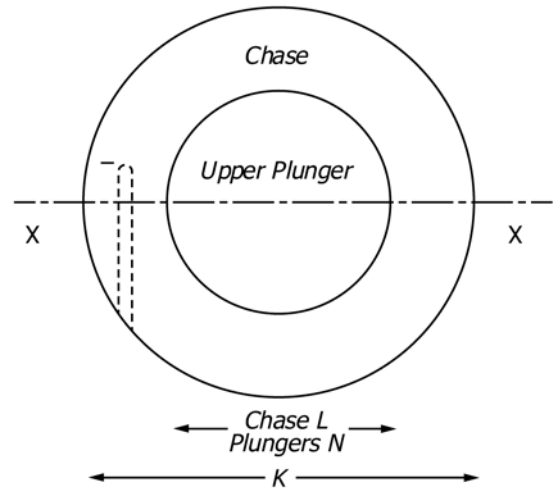


FIG. 2 Compression Mold for Disk Test Specimens

5.2 Molded specimens showing evidence of low-density areas due to trapped gases shall be discarded. A breathe step can be incorporated to eliminate this situation. If used, it is critical that the breathe step be as brief as possible to avoid pre-curing of the compound before full pressure is applied leading to poorly “knitted” areas and lower strength in the molded specimen.

6. Apparatus

6.1 Molds:

6.1.1 The mold shall be made of steel, able to withstand the molding temperatures and pressures. The mold shall be designed such that the compressive mold force is transferred to the molding material with no appreciable loss. The molds shown in Figs. 1 and 2 are recommended for maintaining the maximum force on the material. They are of the three-plate design; consisting of a shell or floating plate, with upper and lower compression plates. Molds may be of single or multiple cavity design.

NOTE 2—Semi-positive molds can be used, and for materials such as amino compounds, are preferred.

6.1.2 The majority of tests will use bars 12.7 mm (0.5 in.) in width by 127 mm (5 in.) or 64 mm (2.5 in.) in length, discs 51 mm (2 in.) or 102 mm (4 in.) in diameter or an appropriate tensile bar as described in Test Method D638 or the multi-purpose design from ISO 3167. The mold shall be capable of molding thickness from 1.5 mm (0.06 in.) to 12.5 mm (0.5 in.). Some procedures such as flame testing require thinner specimens. In all cases the ASTM Standard Test Procedure to be used shall be consulted for the dimensions of the required test specimens.

6.1.3 If at all possible, specimens shall be molded directly to dimension, rather than machined from a plaque to maintain the integrity of any skin effect.

6.1.3.1 If it is necessary for specimens to be machined from plates or plaques, they shall not be taken from the edge of the plaque and a minimum margin of 10 mm (0.5 in.) is recommended. This shall be noted in the report.

6.1.4 A cavity draft angle not exceeding 3° can be used to facilitate specimen removal.

6.1.5 The clearance between the vertical wall of the cavity and that of the force shall not exceed 0.1 mm (0.004 in.).

6.1.6 Mold surfaces finished to a roughness of 0.4 to 0.8 μm (SPI-SPE #2 or equivalent⁴) are preferred, unless it is known that the particular test is not affected by a coarser surface finish. Chrome plating is recommended but not necessary. Draw polishing of all cavity surfaces in the direction parallel to the force will facilitate specimen removal.

6.1.7 If ejector pins are used, they shall not deform the specimens and their placement shall be such that the pin marks are not in the area of test.

6.1.8 The mold shall have a loading chamber of sufficient volume to allow the introduction of the entire charge of material in a single loading. Preforms can be used to decrease the required loading volume of high bulk materials. The conditions of such preforming shall be included in the report.

6.1.9 As the specimen surface facing the lower die is heated for a longer time and at a higher temperature in the time interval between filling and compression, it is recommended that a mark be placed on one cavity face in such a position that it will not interfere with the testing. When reporting the results of tests that affect the surfaces unequally, the tested surface shall be indicated.

6.2 Press—The hydraulic press shall have a range of pressures sufficient to insure that the specified pressure is applied

⁴ Mold comparison kits are available from the D-M-E Company, 29111 Stephenson Highway, Madison Heights, MI 48071.