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Standard Test Method for Shrinkage of Molded and Laminated Thermosetting Plastics at Elevated Temperature¹

This standard is issued under the fixed designation D 1299; 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.

^{ε1} The hazard caveat was added editorially in January 1991.

1. Scope

1.1 This test method covers the determination of the shrinkage characteristics of various thermosetting molded and laminated plastics after exposure to certain prescribed temperatures.

1.2 The test is not expected to predict the behavior of materials in service, but rather provides a means of classifying plastics with respect to shrinkage on a relative basis.

NOTE 1—The values stated in SI units are to be regarded as the standard.

1.3 *This standard does not purport to address the safety problems 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.*

2. Significance

2.1 Plastics experience dimensional change at elevated temperatures at varying rates, usually quite rapidly during the early stages and more slowly at the end of long periods of exposure. Different kinds of plastics also do not behave similarly. It is therefore frequently found that various plastic moldings will occupy different orders when rated according to shrinkage, depending on whether the exposure period has been short or long. For purposes of control work, short exposure periods will usually suffice to indicate shrinkage differences among different batches of the same material. Exposure periods of greater duration will more nearly reflect real differences in shrinkage phenomena, in comparing unlike materials for suitability in particular applications.

2.2 By the use of this test method, it is possible to measure the change in dimensions of specimens at prescribed intervals during their exposure to circulating air at an elevated temperature. By this means, plastics can be compared on a relative basis for this shrinkage after any one of these intervals, or by examining their trends over a number of intervals. While certain industrial materials may be tested at higher temperatures, thus shortening the time required to produce significant shrinkage phenomena, such high temperatures may be inappropriate to other plastics, making it

advisable to use lower temperatures and longer exposure periods. End use as well as the preceding stipulation should assist in the selection of the proper temperature. These data should be useful in making a choice of suitable materials for application where shrinkage is expected to result from atmospheric conditions that are approximately similar to those stipulated in this test method.

3. Apparatus

3.1 *Jig*—A jig with micrometer dial gage attached, capable of measurements accurate to ± 0.013 mm (± 0.0005 in.). A schematic diagram of a fixture suitable for this test is shown in Fig. 1.

3.2 *Gage Block*—A stainless steel bar 13 by 13 by 100 $\pm$ 0.0025 mm (0.5 by 0.5 by 4.000 $\pm$ 0.0001 in.), with ends suitably marked for reference purposes.

3.3 *Oven*—An oven or enclosure meeting the requirements of Type I, Grade B, as specified in ASTM Specifications E 197, for Enclosures and Servicing Units for Tests Above and Below Room Temperature.²

3.4 *Desiccator*—A desiccator of the calcium chloride type.

4. Test Specimens

4.1 Test specimens shall be disks 100 $\pm$ 1.0 mm (4 in.) in diameter and 3.2 $\pm$ 0.13 mm (0.125 $\pm$ 0.005 in.) thick, or 100 $\pm$ 1.0 mm (4-in.) squares of the same thickness. Disks shall be molded according to standard technique and established practice—for thermosetting materials, compression molded, urea type, as described in ASTM Practice D 956, for Compression Molding Specimens of Amino Molding Compounds,³ and for phenolic materials, as described in ASTM Practice D 796, for Compression Molding Test Specimens of Phenolic Molding Compounds,³ or as agreed upon between the purchaser and the seller. Specimens shall be marked with reference marks (either molded in or scratched in place by means of a scribe) at the edge, arranged diametrically opposite in pairs 100 mm (4 in.) apart, with the pairs at 90 deg to each other.

4.2 Three specimens of the material shall be tested, and the results averaged.

5. Conditioning

5.1 *Conditioning*—Condition the test specimens at 23 $\pm$

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.50 on Permanence Properties.

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² Discontinued. See 1982 Annual Book of ASTM Standards, Parts 40 and 41.

³ Annual Book of ASTM Standards, Vol 08.01.