



Designation: D696 – 24

Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and $+30^{\circ}\text{C}$ with a Vitreous Silica Dilatometer¹

This standard is issued under the fixed designation D696; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers determination of the coefficient of linear thermal expansion for plastic materials having coefficients of expansion greater than $1\text{ }\mu\text{m}/(\text{m}^{\circ}\text{C})$ by use of a vitreous silica dilatometer. At the test temperatures and under the stresses imposed, the plastic materials shall have a negligible creep or elastic strain rate or both, insofar as these properties would significantly affect the accuracy of the measurements.

1.1.1 Test Method E228 shall be used for temperatures other than -30°C and $+30^{\circ}\text{C}$.

1.1.2 This test method shall not be used for measurements on materials with a very low coefficient of expansion (that is, less than $1\text{ }\mu\text{m}/(\text{m}^{\circ}\text{C})$). For materials with a very low coefficient of expansion, interferometer or capacitance techniques are recommended.

1.1.3 A common alternative technique is thermomechanical analysis, as described in Test Method E831, which permits measurement of this property over a scanned temperature range.

1.2 The thermal expansion of a plastic is composed of a reversible component on which are superimposed changes in length due to changes in moisture content, curing, loss of plasticizer or solvents, release of stresses, phase changes, and other factors. This test method is intended for determining the coefficient of linear thermal expansion under the exclusion of these factors as far as possible. In general, it will not be possible to exclude the effect of these factors completely. For this reason, this test method can be expected to give only an approximation to the true thermal expansion.

1.3 The values stated in SI units are to be regarded as standard. The values in parentheses are 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—There is no known ISO equivalent to this standard.

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

D618 Practice for Conditioning Plastics for Testing

D883 Terminology Relating to Plastics

D4065 Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures

E228 Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer

E456 Terminology Relating to Quality and Statistics

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

E831 Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis

E2653 Practice for Conducting an Interlaboratory Study to Determine Precision Estimates for a Test Method with Fewer Than Six Participating Laboratories

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.30 on Thermal Properties (Section D20.30.07).

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. 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