



SURFACE VEHICLE STANDARD	J2236™	JUN2023
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Superseding J2236 SEP2010		
Standard Method for Determining Continuous Upper Temperature Limit of Elastomers		

RATIONALE

This document is up for its Five-Year Review. It needs to be reviewed for any possible updates or changes.

1. SCOPE

This method is intended to define the continuous upper temperature limit (CUTL) of thermoplastic elastomers and thermoset rubber with durometer hardness ≤ 90 Shore A, to oxidation or other degradation when exposed solely to hot air for an extended period of time.

- 1.1 This method established the upper thermal aging limits of commercially available compounds as measured at 23 °C by retention of at least 50% original elongation and tensile at break after 1008 hours of heat aging. This method does not take into account nor measure the effects of stress, environment, or temperature variations on the thermal aging characteristics of the materials tested.
- 1.2 This method may involve hazardous materials, operations, and equipment. This SAE Standard does not address the safety problems associated with its use. It is the responsibility of the user of this document to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.
- 1.3 This test method is based on SI units.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

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2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

- SAE J200 Classification System for Rubber Materials
- SAE J2332 Marking of Rubber Parts
- SAE J2558 Classification System for Thermoplastic Elastomers

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

- ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension, Method A
- ASTM D573 Standard Test Method for Rubber—Deterioration in an Air Oven
- ASTM D1418 Standard Practice for Rubber and Rubber Lattices—Nomenclature
- ASTM D1972 Practice for Generic Marking of Plastic Products
- ASTM D2240 Standard Test Method for Rubber Property—Durometer Hardness

3. TERMS SPECIFIC TO THIS STANDARD

3.1 CONTINUOUS UPPER TEMPERATURE LIMIT (CUTL)

The temperature at which the material retains a 50% minimum of both the original elongation and tensile at break after 1008 hours in an air circulating oven per ASTM D573, Type IIA or IIB. Note per ASTM D573, Type IIB ovens are for use through 70 °C. For higher temperatures, Type IIA ovens are necessary.

3.2 TEST METHOD

A definitive procedure for identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material, product system, or service that produces a test result.

3.3 PRODUCTION COMPOUND

An identifiable, homogeneous quantity of material from a standard production period with a consistency and properties demonstrated through testing and use.

3.4 COMMERCIAL MATERIAL

A finished compound developed primarily, but not exclusively, for heat resistance from readily available ingredients and processed on conventional industry equipment.

4. SIGNIFICANCE AND USE

- 4.1 Data obtained by this method are applicable to the material under conditions of this test and are not necessarily the same as those obtained in end use applications. The information may be used for comparison, selection, or qualification of commercially available compounds where a level of proficiency is desired beyond short time quality control tests.

- 4.2 Ultimate elongation was selected over other physical property measurements because of its greater sensitivity to the various effects of air oven aging on elastomers. Tensile strength is also used since some compounds maintain more than 50% of their original elongation while losing considerable tensile strength after heat aging.
- 4.3 A material classification CUTL represents the highest temperature value the compound(s) can achieve per Table A1 guidelines (see Appendix A). The materials are classified according to ASTM D1418 or ASTM D1972. Not all compounds within a material category can reach the listed maximum temperature.
- 4.4 This document requires aging at elevated temperatures in a hot air circulating oven per ASTM D573, regardless of what is used in SAE J200. Care must be taken to test only similar generic compounds (i.e., silicone to silicone) in order to avoid cross contamination from volatile products and subsequent variation in test data.

5. GENERAL TEST CONDITIONS

- 5.1 Unless otherwise specified, the material shall be tested to ASTM D412 Die C, Method A requirements at 23 °C.

5.2 Aging Temperatures

Variation around a specified temperature shall be within ± 2 °C.

5.3 Aging Temperature Increments

Unless otherwise specified, test new materials (per SAE J200 Table 1, plus 135 °C and 165 °C) to establish the upper continuous temperature limit to the definition in 3.1. Material tables shall be established using this criterion to minimize testing burden.

5.4 Aging Time

1008 hours \pm 2 hours.

5.5 Uniform Aging Conditions

Tests of samples shall ensure that all surfaces be exposed and the temperature uniform.

6. SAMPLE REQUIREMENTS

- 6.1 Thermoplastic elastomer and thermoset rubber elongation and tensile at break data used to establish tables or qualify new materials shall be the median of a minimum of five samples per batch from six different batches.

6.2 Sample Dimensions for Thermoset Rubber

Follow ASTM D412 requirements using Die C.

6.3 Thermoplastic Elastomers (from SAE J2558)

Unless otherwise noted, samples are to be die cut from molded rectangular plaques 2.0 mm \pm 0.4 mm thick. Specimens of other thickness will not necessarily give comparable results. Plaque dimensions must be sufficient to permit this. Five samples are to be tested in the direction of highest tensile strength and the median value is reported for both elongation and tensile at break.

- 6.4 Certain elastomers may require post curing or other conditions to achieve optimum heat resistance properties.

7. TABLE REQUIREMENTS

- 7.1 The material heat resistance table (Table A1) in the appendix shall be developed using temperatures from SAE J200 Table 1 and additional temperatures (135 °C and 165 °C) appropriate to industry needs. If a material meets the requirement at a specified temperature, it is presumed that it will meet them at all lower temperatures.

7.2 Test commercially available compounds to Section 5 conditions for 1008 hours. Determine the percent elongation and tensile at break prior to and immediately after the test period per ASTM D412 Die C for thermoset and thermoplastic materials with durometer hardness equal to or less than 90 Shore A.

7.3 Test at 23 °C and report results for the number of samples stated in 6.1.

7.4 A material will qualify for inclusion in the temperature classification table (Table A1) when test data satisfies the requirements of 3.1.

8. PRECISION AND BIAS

8.1 No precision statement exists for 1008 hours oven aging per ASTM D573. Refer to ASTM D573 for the precision of oven aging after 48 hours and 96 hours and ASTM D412 for precision of tensile testing.

9. NOTES

9.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

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