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# UL 746A

## STANDARD FOR SAFETY

Polymeric Materials – Short Term  
Property Evaluations

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UL Standard for Safety for Polymeric Materials – Short Term Property Evaluations, UL 746A  
Sixth Edition, Dated September 6, 2012

### **SUMMARY OF TOPICS**

***This revision of ANSI/UL 746A dated March 17, 2023 includes the addition of the definition and threshold of polymer blends used as an additive in [Table 9.1](#).***

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated November 11, 2022.

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**ANSI/UL 746A-2023**

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**UL 746A**

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**Sixth Edition**

**September 6, 2012**

This ANSI/UL Standard for Safety consists of the Sixth Edition including revisions through March 17, 2023.

The most recent designation of ANSI/UL 746A as an American National Standard (ANSI) occurred on March 17, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page. Any other portions of this ANSI/UL standard that were not processed in accordance with ANSI/UL requirements are noted at the beginning of the impacted sections.

The Department of Defense (DoD) has adopted UL 746A on November 3, 1988. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in ULSE's Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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## INTRODUCTION

### 1 Scope

1.1 These requirements cover short-term test procedures to be used for the evaluation of materials used for parts intended for specific applications in electrical end products.

1.2 Together with the requirements mentioned in Supplementary Test Procedures, Section 5, these investigations provide data with respect to the physical, electrical, flammability, thermal, and other properties of the materials under consideration and are intended to provide guidance for the material manufacturer, the molder, the end-product manufacturer, safety engineers, and other interested parties.

1.3 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

### 2 Units of Measurement

2.1 If a value for measurement as given in these requirements is followed by an equivalent value in other units, in parentheses, the second value may be only approximate. The first stated value is the other requirement.

### 3 References

3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3.2 Appendix D contains a list of ASTM test procedures referenced in this standard.

### 4 Glossary

4.1 For the purposes of this standard the following definitions apply:

4.1A **CHEMICALLY RECYCLED PLASTICS** – The process in which traditional polymerization starting ingredients (e.g., fossil-based “pre-cracker” hydrocarbons or polymerization monomers) are sourced from compounds derived from the chemical or thermal decomposition of plastics (reconstituted).

NOTE: For the purpose of this Standard, starting ingredients sourced from plant-based matter or other non-traditional inputs for the polymerization of plastics can be identified as chemically recycled.

4.2 **MAXIMUM REGRIND LEVEL (MRL)** – Percentage by weight of regrind in a polymeric material that may not be exceeded when used in further molding processes.

4.3 **MOLDER** – Performs injection, extrusion, transfer, compression, rotational, co-molding, thermoforming, reaction injection molding, pultrusion, open mold or hand lay-up processes.

4.4 **POLYMERIC MATERIAL** – A compound formed by chemical reaction that results in large molecules whose molecular weight is a multiple of that of the original substance (monomer). Includes thermoplastic,

thermoset, and elastomeric materials. Polymeric materials are available in different molecular weights and colors, and with different types and quantities of fillers, reinforcements, and additives (see [9.9.1](#)).

4.5 REGRIND – A noncontaminated product or scrap such as sprues and runners that have been reclaimed by shredding, repelletizing, and granulating for use in-house.

## 5 Supplementary Test Procedures

5.1 The requirements in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, covers flammability of polymeric materials used for parts in devices and appliances. The Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B, contains long-term test procedures to be used for the evaluation of materials used for parts intended for specific applications in end products. Test procedures are provided in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluation, UL 746C, for the evaluation of polymeric materials in specific applications in end products. The test procedures include reference to the data obtained from the standard property tests in UL 746A, as well as other practical means of evaluation. The Standard for Polymeric Materials – Fabricated Parts, UL 746D, contains requirements for traceability and performance of parts molded and fabricated from polymeric materials.

5.2 Programs for the investigation of material part modifications, such as the plating of plastics or the use of flame-retardant paints, are contained in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. Other requirements for the bond strength of plated plastics are described in Bond Strength of Plated Polymeric Materials, Section [18](#) of this standard.

5.3 Data concerning the effect of various environments and contaminants upon the properties of materials can also be obtained through standard test procedures. The more commonly used procedures are briefly described in this standard.

5.4 Requirements for materials that have been modified to match the requirements of a specific application, including the use of recycled and regrind materials, the use of additives and colorants, and the blending of two or more materials, are described in the Standard for Polymeric Materials – Fabricated Parts, UL 746D.

## 6 Alternate or Equivalent Test Methods

6.1 If a designation for a test method is followed by an alternate or equivalent designation, in parenthesis, the latter method can be considered technically equivalent, though not necessarily identical, and might yield somewhat different numerical test results. Where significant differences exist, the use of such alternate or equivalent methods should be restricted to studies of comparative behavior using the same method exclusively, such as monitoring degradation behavior before, during and/or after thermal aging (746B) or other special conditioning.

## 7 Characteristics of Polymeric Materials

7.1 Polymeric materials include thermoplastic, thermosetting, and elastomeric materials. A thermoplastic material can be easily softened and re-softened by repeated heating. A thermosetting material cures by chemical reaction when heated and, when cured, cannot be re-softened by reheating. An elastomeric material is capable of being stretched at room temperature to at least twice its length under low stress and recovers to its original length when released from the stress.

7.2 Characteristics of polymeric materials that are to be given additional consideration include:

- a) Molded stresses

- b) Insulating quality
- c) Resistance to ignition
- d) Extinguishing characteristics
- e) Production of smoke and gases
- f) Physical and electrical properties
- g) Compatibility with solvents
- h) Melting or distortion
- i) Cold flow, if under stress
- j) Fuel contribution
- k) Dimensional stability

## 8 Use of Polymeric Materials

8.1 The safety of electrical equipment depends upon the correct selection of materials, design, and processing of parts as well as the assembly, mounting, and relative positions of these parts.

8.2 The properties needed by individual parts are defined by the function or functions of the part. An enclosure, for example, must ordinarily be designed to withstand mechanical abuse. Accordingly, a material known to have substantial impact strength would normally be used although a material of lower impact strength that is reinforced may also be satisfactory.

8.3 Electrical equipment of necessity employs many materials that usually have divergent properties. The ability to match the demands of the application with the attributes of a material as well as the ability to compare the properties of one material with those of another can lead to the selection of an acceptable material.

8.4 The information gained from the data obtained from these tests can be used as an aid to the evaluation of electrical equipment using parts made of polymeric materials. Knowledge of materials can be obtained from an analysis of data from standard tests conducted on small specimens.

## 9 General

### 9.1 Selection of samples and test specimens

9.1.1 Samples shall be obtained if possible from the products to be tested, taken at random, and in such case shall be taken in accordance with the requirements for the particular material.

*Exception: When it is not practical to obtain test specimens from the finished article, the manufacturer shall furnish molded test specimens, or sample sheets as required in the individual test method. The number of specimens to be tested in each type of test shall be as specified in the individual test method; if not so specified, at least five specimens shall be tested.*

### 9.2 Preparation of specimens

9.2.1 When it is necessary to machine specimens, the work is to be done in accordance with the manufacturer's recommended technique for the material involved. Tools are to be kept sharp and used so