UL 796F

STANDARD FOR SAFETY

Flexible Materials Interconnect Constructions

UL Standard for Safety for Flexible Materials Interconnect Constructions, UL 796F

Fourth Edition, Dated February 26, 2021

Summary of Topics

This revision of ANSI/UL 796F dated January 27, 2022 is issued to Update Sample Thickness Measurement Requirements; 12.1.6.9, 12.1.6.10, and 12.1.6.10A

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

The news and revised requirements are substantially in accordance with Proposal(s) on this subject dated November 19, 2021.

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UL 796F

Standard for Flexible Materials Interconnect Constructions

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Third Edition – August, 2015

Fourth Edition

February 26, 2021

This ANSI/UL Standard for Safety consists of the Fourth Edition including revisions through January 27, 2022.

The most recent designation of ANSI/UL 796F as an American National Standard (ANSI) occurred on January 21, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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

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INTRODUCTION

1 Scope

1.1 These requirements apply to flexible material printed wiring board constructions (FMIC's) for use as components in flexible, flex-to-install, rigid, and multilayer rigid-flex composite applications with and without stiffener and adhesive materials in devices or appliances.

1.2 Together with the Standards mentioned in the Supplementary Test Procedures, Section 3, these requirements provide data with respect to the physical, electrical, flammability, thermal, and other properties of the FMIC under consideration and are intended to provide guidance to the fabricator, end product manufacturer, safety engineers and other interested parties.

1.3 Compliance with these requirements does not indicate the product is acceptable for use as a component of an end product without further investigation.

1.4 The singlelayer and multilayer flexible, flex-to-install, and multilayer rigid-flex composite constructions addressed by these requirements consist of conductors affixed to base material, with mid-board interconnections, and cover materials.

1.5 The suitability of additional stiffener and adhesive materials, not evaluated in accordance with Stiffener and adhesive (external bonding) materials, 8.10, the Stiffener bond strength test, 12.12, and Flammability tests, 12.15, are subject to the applicable end-use product construction and performance requirements. See Additional stiffener and adhesive (external bonding) materials, 13.12, for marking requirements for FMIC's provided with additional stiffener and adhesive materials not investigated.

1.6 The requirements for rigid printed wiring boards are in the Standard for Printed Wiring Boards, UL 796.

2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3 Supplementary Test Procedures

3.1 These requirements are intended to be used in conjunction with the following requirements or standards:

a) The Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A, the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B, the Standard for Polymeric Materials – Industrial Laminates, Filament Wound Tubing, Vulcanized Fibre, and Materials Used in Printed Wiring Boards, UL 746E, and the Standard for Polymeric Materials – Flexible Dielectric Film Materials for Use in Printed Wiring Boards and Flexible Materials Interconnect Constructions, UL 746F, contain programs for investigating polymeric materials and industrial laminates.

b) The Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, contains methods for evaluating the flammability of polymeric materials that are intended to be used in electrical equipment.

c) The Standard for Printed Wiring Boards, UL 796, covers the minimum performance requirements for rigid printed wiring boards.

4 References

4.1 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.

4.2 The following publications are referenced in this standard:

ASTM D 149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.

ASTM D 374 – Standard Test Methods for Thickness of Solid Electrical Insulation.

ASTM D 1000 – Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.

ASTM D 5374 – Standard Test Methods for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation.

ASTM D 5423 – Standard Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation.

ASTM D 618 – Standard Practice for Conditioning Plastics for Testing

ASTM E 3 – Standard Practice for Preparation of Metallographic Specimens.

IPC TM-650 2.1.1 – Microsectioning, Manual and Semi or Automatic Method.

ISO 291 – Plastics – Standard Atmospheres for Conditioning and Testing.

5 General

5.1 Acceptability of an FMIC in a device or appliance depends on the acceptability of the construction for:

a) Continued use under actual service conditions, including the maximum operating temperature (MOT);

b) Flammability properties; and

c) All other applicable end-product requirements.

5.2 The investigation of an FMIC shall include consideration of the conductor properties, such as weight (thickness), minimum midboard and edge width, and maximum ground plane area, and shall include the conductor forming and materials build-up processes including solder limits.

5.3 Except as indicated in 5.4, the factors considered in testing the FMIC conductor supporting material in its application shall include mechanical strength, moisture absorption, combustibility, resistance to ignition from electrical sources, dielectric strength, insulation resistance, resistance to arc-tracking, and resistance to creeping and distortion at temperatures to which the material is subjected in the end product. The conductor supporting material shall not display a loss of these properties beyond the minimum acceptable level as a result of aging, and relative temperature indices shall be assigned to the conductor supporting material.

5.4 If an FMIC is entitled with flammability classification only, the acceptability of the FMIC shall involve only flammability tests. See Flammability tests, 12.15.

5.5 An FMIC entitled flexible is intended for use where the construction is subject to dynamic flexing applications, yet the flexural endurance of the construction has not been evaluated.

5.6 An FMIC entitled flex-to-install is intended for use where the construction is flexed for installation or service (only) and shall not be subject to dynamic or repeated flexing applications, yet the flexural endurance of the construction has not been evaluated.

5.7 An FMIC entitled rigid is intended for use where the construction is not flexed or subject to dynamic or repeated flexing applications.

5.8 Multilayer rigid flex composite constructions may include single-sided, double-sided, singlelayer and multilayer flexible, flex-to-install, and rigid constructions in various sections of an FMIC.

6 Glossary

6.1 For the purpose of this Standard the following definitions shall apply.

6.2 ACCESS HOLE – Holes on the same axis through successive layers of materials intended to provide access to the surface of the land on an inner conductor layer of a multilayer category construction.

6.3 ADDITIVE PROCESS – A selective or non-selective process used to deposit a pattern of conductor material(s) on clad or unclad base material.

6.4 ADD-ON COMPONENT – Discrete, integrated, packaged, or chip components that are attached to an FMIC to function as part of a complete circuit or assembly.

6.5 ADHESIVE – A substance such as glue or cement used to join, bond, or fasten materials or objects together.

6.6 AS-RECEIVED – Samples or samples in an unconditioned state, prior to being subject to conditioning, or without a history of conditioning.

6.7 ASSEMBLY – Various parts, subassemblies, and combinations thereof, joined together.

6.8 BARE BOARD – An unpopulated FMIC without add-on or embedded components or assemblies.

6.9 BASE DIELECTRIC MATERIAL – An organic or inorganic dielectric barrier material, used to support conductor material.

6.10 BASE MATERIAL – An organic or inorganic insulating material used to support a pattern of conductor material, with or without integral adhesive material, with or without integral conductor material.

6.11 BASE MATERIAL THICKNESS – The thickness of the base dielectric material excluding conductive foil or material deposited on the surfaces. If an adhesive is used for the base material, the adhesive thickness and number of sides is indicated separately.

6.12 BLIND VIA – A via extending to only one surface of the printed wiring board construction.

6.13 BLISTERING – Localized area of delamination. See Delamination, 6.60.

6.14 BONDING FILM– The layer of insulation used to bond discrete layers during lamination of multilayer flexible printed wiring board constructions. A general term used to describe bondply and