



Designation: F3290 – 17

# Standard Guide for Handling and Application of a Membrane Switch or Printed Electronic Device to its Final Support Structure<sup>1</sup>

This standard is issued under the fixed designation F3290; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This guide covers proper handling and application of a flexible circuit membrane switch, or printed electronic assembly to its final support structure to avoid mechanical or electrical failure.

1.2 Damage of internal tactile devices or surface mount device (SMD) components can occur with excessive flexing or bending during lamination, repositioning, from uneven support surface, air entrapment, or pressing keys when unsupported.

1.3 Design considerations and material selection can impact the membrane switch or the printed electronic device's ability to endure the mechanical stress that can occur in handling, application and use. These should be considered as early as possible in the design phase.

1.4 Recent advancements in printed electronic polymer materials have shown increased reliability from flexing and creasing, replacing copper flex circuits in many cases.

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:*<sup>2</sup>

- F2749 Test Method for Determining the Effects of Creasing a Membrane Switch or Printed Electronic Device
- F2750 Test Method for Determining the Effects of Bending a Membrane Switch or Printed Electronic Device
- F3147 Test Method for Evaluating the Reliability of Surface Mounted Device (SMD) Joints on a Flexible Circuit by a

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.18 on Printed Electronics.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

## Rolling Mandrel Bend

## 3. Terminology

3.1 *Definitions:*

3.1.1 *membrane switch (MS), n*—a momentary switching device in which at least one contact is on, or made of, a flexible substrate.

3.1.2 *printed electronic device (PED), n*—electrically functional device manufactured primarily using an additive process, with or without attached conventional or other electronic components, often in flexible format.

## 4. Summary of Guide

4.1 This guide provides recommendations or best practices to prevent damage to membrane switches or printed electronic devices from unsupported use or excessive stress during the application to the final supporting structure.

## 5. Significance and Use

5.1 Membrane switches or printed electronic devices are tested for function and aesthetically inspected by the manufacturer before release to the end user. The user can unknowingly damage the device beyond repair prior to, or during, the application (laminating) process.

5.2 Awareness and proper techniques are essential to the end user and this guide should be noted on all drawings, quality control documentation, and assembly instructions. Proper training and practice must be provided to work area supervisors and their staff.

5.3 Concerning materials choice, consistency, and design in use, it is important to know what to look for and how to design for durability and to test for or prevent potential failures, or both.

5.4 Component failure due to handling damage is one of the most common causes of customer complaints. It is the end user's responsibility to ensure that the product is not damaged during installation

5.5 In the event of component failures a comparison of pre- and post-assembly test performance may help determine the cause of failure. Even if an acceptable change is noted, it may be the result of the unit being over stressed and the application