



Standard Practice for Creasing or Bending a Membrane Switch, Membrane Switch Flex Tail Assembly or Membrane Switch Component¹

This standard is issued under the fixed designation F1683; 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.

1. Scope

1.1 This practice establishes a method for the creasing or bending of any part of a membrane switch.

1.2 This practice can be used with other test methods to achieve specific test results.

1.3 The values stated in SI units are to be regarded as the standard. The values given 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

F2749 Test Method for Determining the Effects of Creasing a Membrane Switch or Assembly

F2750 Test Method for Determining the Effects of Bending a Membrane Switch or Assembly

3. Terminology

3.1 *Definitions:*

3.1.1 *bend*—to force from a straight form into a different and especially a curved one.

3.1.1.1 *Discussion*—In this case no “hard” or angled crease or fold is to occur. The substrate will only be formed into a radius.

3.1.2 *bend cycle*—a fold of a sample around a specified mandrel which is “rolled” in one direction, followed by rolling in the opposite direction, returning the sample to its original position (see Fig. 1).

¹ This practice is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.18 on Membrane Switches.

Current edition approved June 15, 2009. Published July 2009. Originally approved in 1996. Last previous edition approved in 2005 as F1683 – 05^{ε1}. DOI: 10.1520/F1683-09.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

3.1.3 *crease*—a ridge or groove made by folding and pressing.

3.1.3.1 *Discussion*—In this case a fold mark in the substrate will be caused by a weight rolled over a fold that will likely remain in the substrate after testing.

3.1.4 *crease cycle*—a 180° crease followed by a flattening of the crease (see Fig. 2).

3.1.5 *mandrel*—a cylindrically shaped metal rod, such as brazing or drill rod.

3.1.6 *membrane switch*—a momentary switching device in which at least one contact is on, or made of, a flexible substrate.

3.1.7 *membrane switch tail*—a flexible portion of a membrane switch used for input/output connection.

4. Significance and Use

4.1 Bending or creasing of membrane switches or their components can affect their visual appearance, mechanical integrity or electrical functionality. This practice simulates conditions that may be seen during manufacture, installation or use.

4.2 Bend or crease testing may be destructive, therefore any samples tested should be considered unfit for future use.

4.3 Specific areas of testing include, but are not limited to:

4.3.1 Membrane switch flex tails, and

4.3.2 Any component of a membrane switch that may be subjected to bending or creasing.

5. Interferences

5.1 The following parameters may affect the results of this test:

5.1.1 Temperature, and

5.1.2 Humidity.

5.1.3 Due to manual nature of this practice, repeatability and reproducibility will be significantly impacted. For a more precise, repeatable procedure, see Test Methods **F2749** and **F2750**.

6. Apparatus

6.1 *Crease Practice:*

Bend Cycle

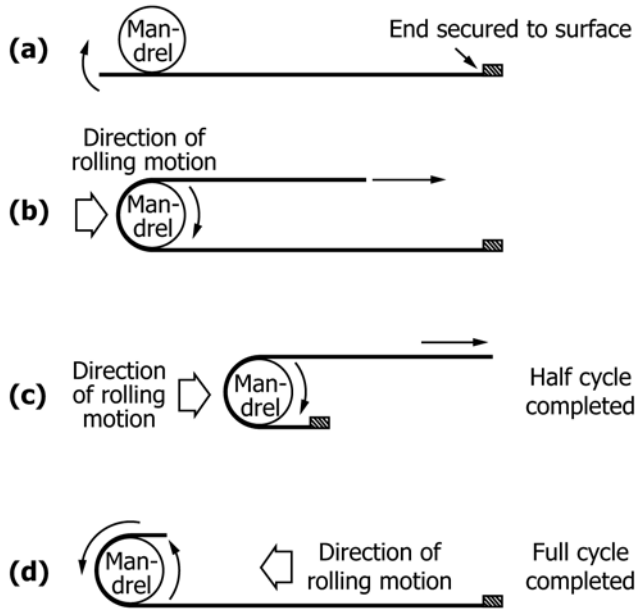


FIG. 1 Bend Cycle

Crease Cycle

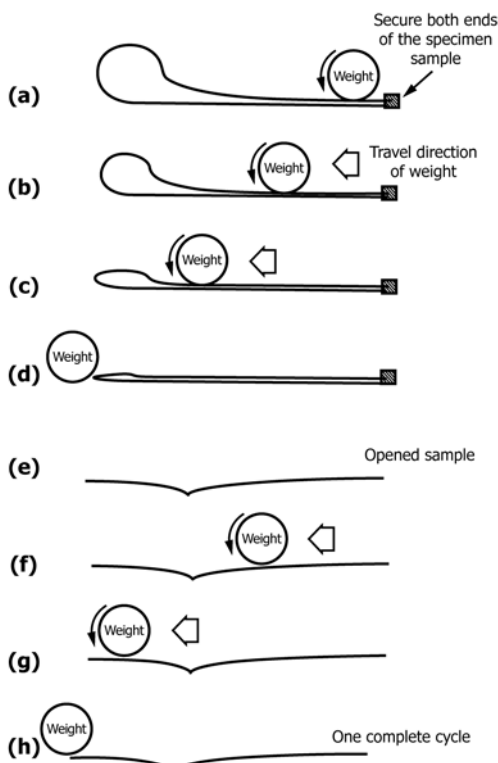


FIG. 2 Crease Cycle

6.1.1 *Cylindrical Weight*, ³ 1 kg in size, measuring 50.8 mm (2 in.) in diameter by 68.6 mm (2.7 in.) in height. Weight and dimensions of weight to be within $\pm 5\%$.

6.1.2 *Cylindrical Weight*, ³ 2 kg in size, measuring 63.5 mm (2.5 in.) in diameter by 86.4 mm (3.4 in.) in height. Weight and dimensions of weight to be within $\pm 5\%$.

6.1.3 *Other Dimensions or Weight* to be specified by manufacturer or customer, or both.

6.1.4 *Adhesive Tape* or fixture to hold specimen securely in place (see Fig. 3).

NOTE 1—The fixture illustrated in Fig. 3 is recommended to ensure repeatability of crease location if multiple cycles are required.

6.2 Bend Practice:

6.2.1 *Diameter Mandrel*, to be specified by manufacturer or customer.

6.2.2 *Adhesive Tape* or fixture to hold specimen securely in place.

7. Test Specimens

7.1 The test specimens may be components, tail assemblies or finished switches subject to bending or creasing.

7.2 The width of the test specimen must not exceed the length of the mandrel or height of the weight to be used.

8. Procedure

8.1 Crease Procedure:

8.1.1 Securely attach one end of the specimen to be tested to a hard flat surface.

8.1.2 Gently bend the test specimen into as large a loop as possible. Secure the loose end of the specimen (top portion of the loop) to the previously secured end.

8.1.3 Roll the weight from the secured ends of the specimen towards the end of the loop (Fig. 2) at a speed of approximately 25 mm/s (1 in./s). Roll the weight completely off the end of the loop creating a crease.

8.1.4 Immediately open the creased specimen such that the crease is now open and facing up (Fig. 2 e-h).

8.1.5 Roll the specified weight over the crease in the same manner as before to flatten the crease.

8.1.6 Repeat for specified number of cycles.

NOTE 2—Care must be taken to ensure that the weight rests only on the specimen, not on adjacent surfaces. In addition, the direction of travel of the weight must be perpendicular to the crease. This is to ensure the entire width of the specimen is creased at the same time.

8.2 Bend Procedure:

8.2.1 Wrap the unsecured end of the specimen tightly over the mandrel such that the specimen contacts 50% of the circumference surface of the mandrel. Push the mandrel and specimen towards the secured end such that the mandrel rolls

³ Cylindrical weights of 1 kg or 2 kg, No. W-111-08Y-1 and No. W-111-09Y-2 have been found suitable for this purpose.

The sole source of supply of the apparatus known to the committee at this time is Toledo Scale Canada Ltd., (Industrial Weighing Equipment, Scales and Systems), 735 Toledo Ct., P.O. Box 4112, Burlington, Ont., Canada LRV 3Y8. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

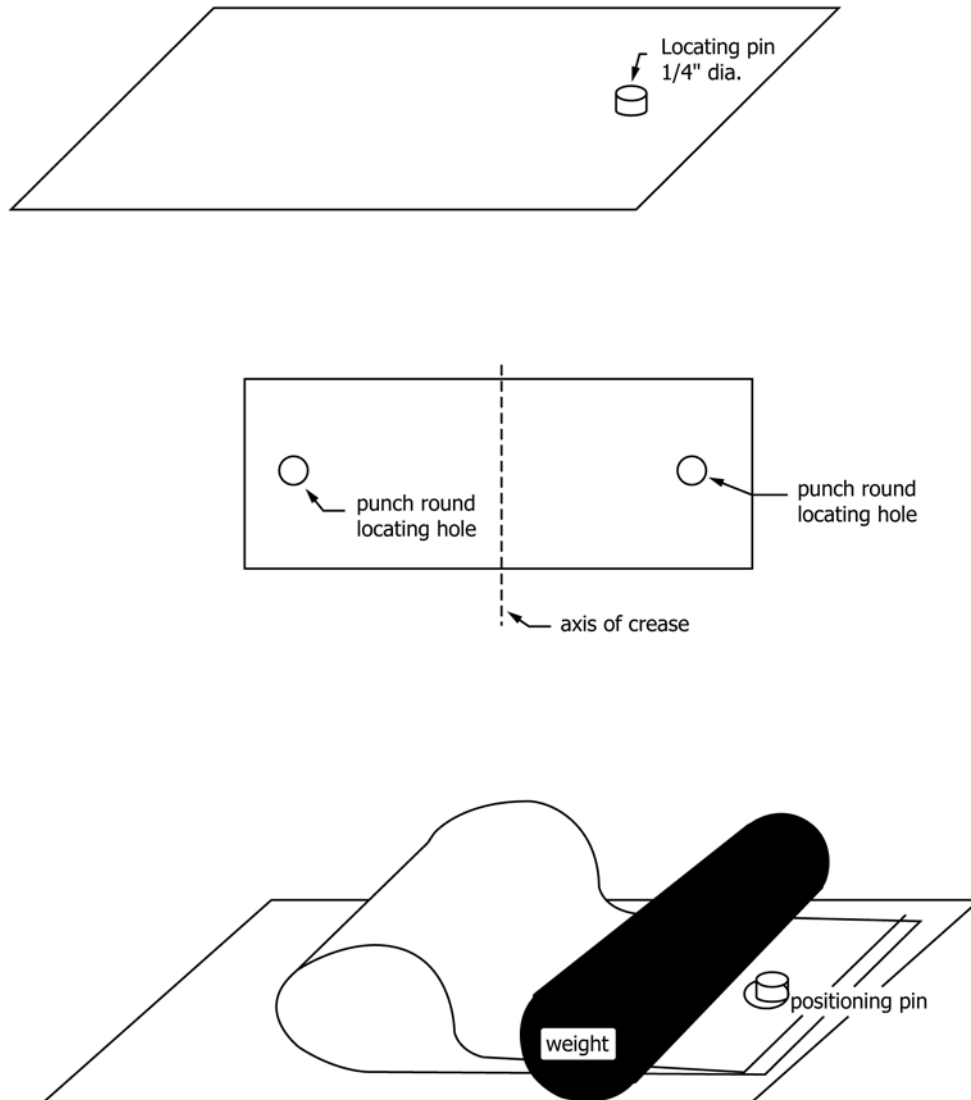


FIG. 3 Suggested Fixture for Holding Specimen Firmly in Place Ensuring Repeatability of Crease Location

within the looped section of the specimen. Reverse the motion such that the specimen and mandrel are returned to their original position. This completes one bend cycle (see Fig. 1).

NOTE 3—Care must be taken to ensure the mandrel remains perpendicular to the length of the specimen throughout the duration of this procedure.

9. Report

9.1 Report the following information:

9.1.1 Temperature,

9.1.2 Humidity,

9.1.3 Specify whether crease or bend procedure was performed,

9.1.4 Number of cycles per specimen,

9.1.5 Part number or description of specimen,

9.1.6 Date of test,

9.1.7 Which surface of specimen is on inside (compression) of crease and which side is on outside (expansion) of crease,

9.1.8 Diameter of mandrel, and

9.1.9 Weight ratio per linear inch (millimetre) width of the specimen. (Expressed as pounds or kilograms per linear inch width, example: 2.2 lb used to crease a 2.4-in. wide specimen would be stated 2.2 lb/2.4 in. = 0.83 lb/in.).

10. Keywords

10.1 bend; crease; membrane switch; tail assembly

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT/).