



Designation: **F 1683—96a 1683 – 02**

## **Standard Practice for Creasing or Bending a Membrane Switch, Membrane Switch Flex Tail Assembly or Membrane Switch Component <sup>1</sup>**

This standard is issued under the fixed designation F 1683; 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 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. Terminology**

- 2.1 *Definitions:*
  - 2.1.1 *bend*—to force from a straight form into a different and especially a curved one.
    - 2.1.1.1 *Discussion*—In this case no "hard" or angled crease or fold is to occur. The substrate will only be formed into a radius.
  - 2.1.2 *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).
  - 2.1.3 *crease*—a ridge or groove made by folding and pressing.
    - 2.1.3.1 *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.
  - 2.1.4 *crease cycle*—a 180° crease followed by a flattening of the crease (see Fig. 2).
  - 2.1.5 *mandrel*—a cylindrically shaped metal rod, such as brazing or drill rod.
  - 2.1.6 *membrane switch*—a momentary switching device in which at least one contact is on (or made of) of, a flexible substrate.
  - 2.1.7 *membrane switch tail*—a flexible portion of a membrane switch used for input/output connection.

### **3. Significance and Use**

- 3.1 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.
- 3.2 Bend or crease testing may be destructive, therefore any samples tested should be considered unfit for future use.
- 3.3 Specific areas of testing include, but are not limited to:
  - 3.3.1 Membrane switch flex tails, and
  - 3.3.2 Any component of a membrane switch that may be subjected to bending or creasing.

### **4. Interferences**

- 4.1 The following parameters may affect the results of this test:
  - 4.1.1 Temperature, and
  - 4.1.2 Humidity.

### **5. Apparatus**

- 5.1 *Crease Practice:*

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## Bend Cycle

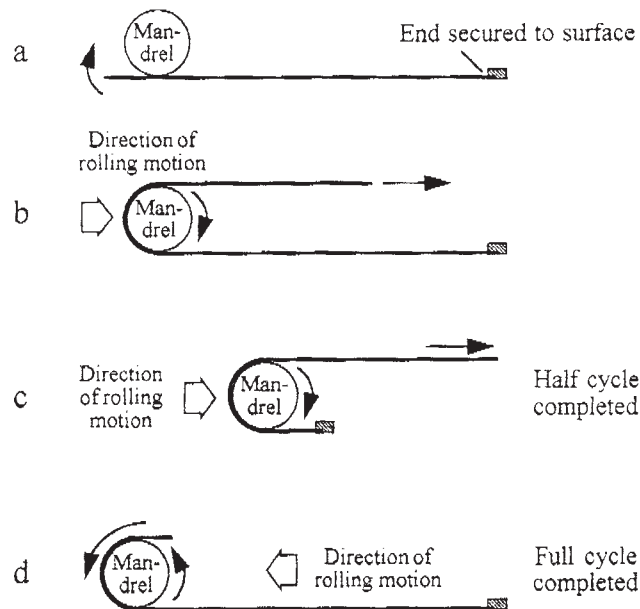


FIG. 1 Bend Cycle

5.1.1 *Cylindrical Weight*, <sup>2</sup> 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  $\pm 5\%$ .

5.1.2 *Cylindrical Weight*, <sup>2</sup> 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  $\pm 5\%$ .

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

5.1.4 *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.

5.2 *Bend Practice:*

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

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

## 6. Test Specimens

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

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

## 7. Procedure

7.1 *Crease Procedure:*

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

7.1.2 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.

7.1.3 Roll the weight from the secured ends of the specimen towards the end of the loop (Fig. 2) at a speed of ~~20.4 mm~~ approximately 25 mm/s (1-in./s  $\pm 20\%$  in./s). Roll the weight completely off the end of the loop creating a crease.

7.1.4 Immediately open the creased specimen and turn it over such that the crease is now open and facing down.

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

7.1.6 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.

7.2 *Bend Procedure:*

<sup>2</sup> Cylindrical weights of 1 kg or 2 kg available from Toledo Scale Canada Ltd., (Industrial Weighing Equipment, Scales and Systems), 735 Toledo Ct., P.O. Box 4112, Burlington, Ont., Canada LRV 3Y8, as No. W-111-08Y-1 and No. W-111-09Y-2 have been found suitable for this purpose.

## Crease Cycle

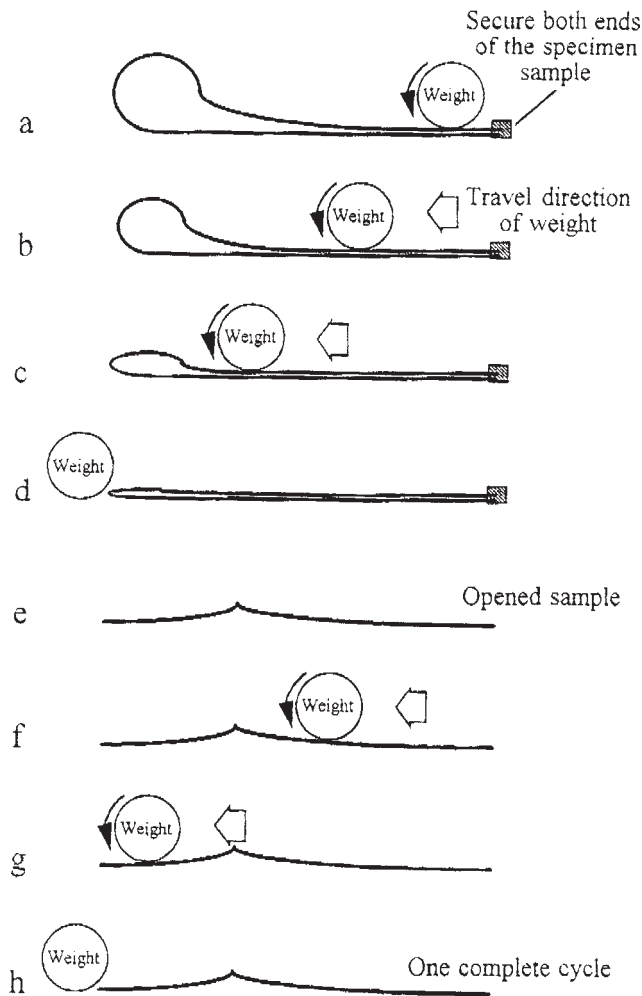


FIG. 2 Crease Cycle

7.2.1 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 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.

### 8. Report

8.1 Report the following information:

8.1.1 Temperature,

8.1.2 Humidity,

8.1.3 Specify whether crease or bend procedure was performed,

8.1.4 Number of cycles per specimen,

8.1.5 Part number or description of specimen,

8.1.6 Date of test,

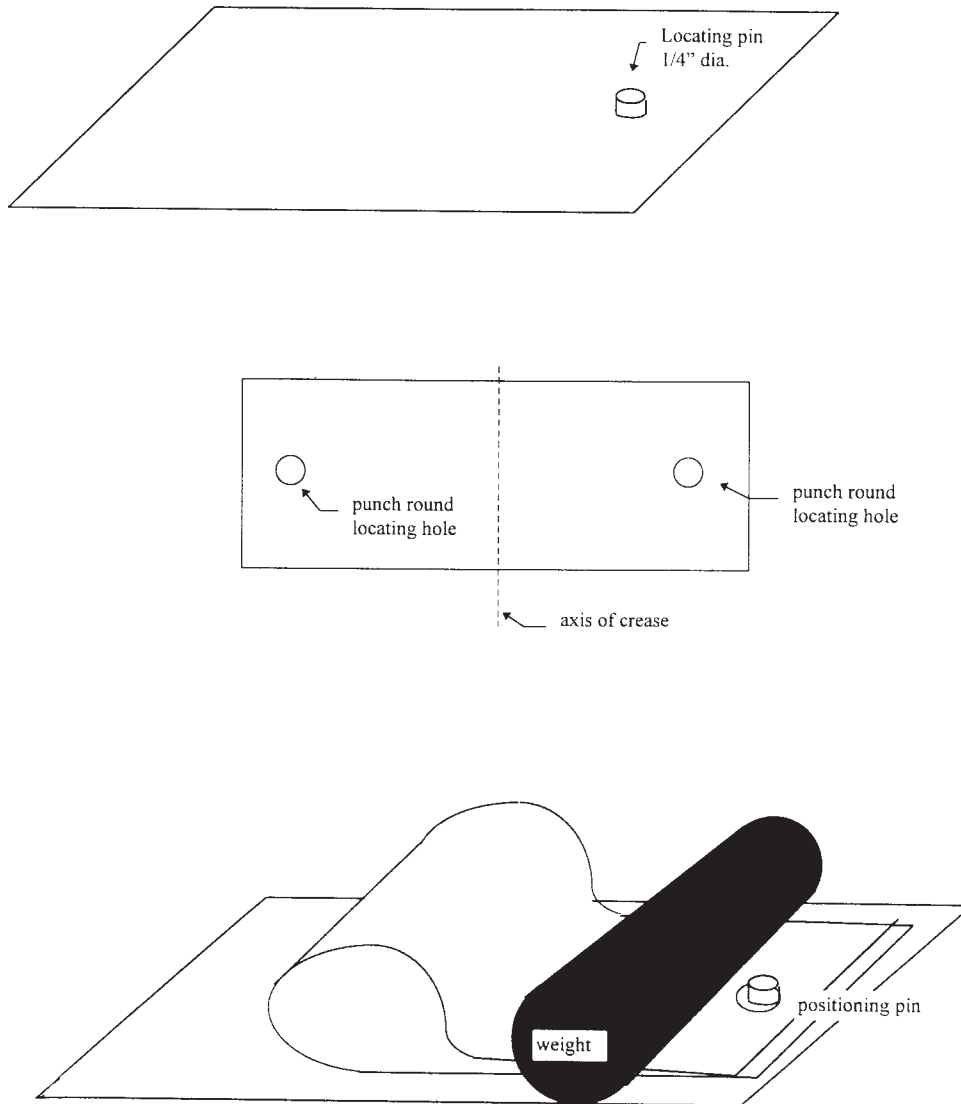
8.1.7 Which surface of specimen is on inside (compression) of crease and which side is on outside (expansion) of crease,

8.1.8 Diameter of mandrel, and

8.1.9 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.).

### 9. Keywords

9.1 bend; crease; membrane switch; tail assembly



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

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