Designation: F1762 – 14

# Standard Test Method for Determining the Effects of Atmospheric Pressure Variation on a Membrane Switch[1]

This standard is issued under the fixed designation F1762; 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 test method covers a procedure for exposing a membrane switch to variations in atmospheric pressure. It can be used to determine the effects of pressure variations on chemical and mechanical properties and functional characteristics of the switch.

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

F1595 Practice for Viewing Conditions for Visual Inspection of Membrane Switches

F1663 Test Method for Determining the Capacitance of a Membrane Switch

F1680 Test Method for Determining Circuit Resistance of a Membrane Switch

F1689 Test Method for Determining the Insulation Resistance of a Membrane Switch

F1895 Test Method for Submersion of a Membrane Switch

F2592 Test Method for Measuring the Force-Displacement of a Membrane Switch

## 3. Terminology

3.1 *Definitions:*

3.1.1 *circuit resistance*—electrical resistance as measured between two test points whose internal contacts, when held closed, complete a circuit.

3.1.2 *contact closure*—the event at which a specified resistance is achieved on a membrane switch.

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

3.1.4 *specified resistance*—the maximum allowable circuit resistance as measured between two test points whose internal contacts, when held closed, complete a circuit.

3.1.5 *test points*—two preselected conductive points in a circuit loop, possibly including a switch.

## 4. Significance and Use

4.1 Erratic operation or malfunction of a membrane switch resulting from changes in the specified switch characteristics,

4.2 Rupture, implosion or explosion of seals due to pressure variations,

4.3 Change in physical or chemical properties due to pressure differentiations, and

4.4 Delaminations of a membrane switch may occur due to pressure variations.

## 5. Interferences

5.1 Time duration before, during and after pressure cycling,

5.2 Temperature,

5.3 Humidity,

5.4 Mounting Method (if applicable).

## 6. Apparatus

6.1 *Pressure Chamber,* a chamber or cabinet capable of maintaining a specified pressure. If procedurally required, the apparatus shall be capable of providing pressure variation at a specified rate.

6.2 *Monitoring Device,* suitable to detect contact closure (that is, ohm meter, etc.).

## 7. Conditioning

7.1 Condition all specimens for 72 h at ambient laboratory conditions immediately prior to exposure, or prior to pressure cycling. This is to enable the specimens to stabilize.

## 8. Procedure

8.1 *Pretest Setup:*

[1] This test method 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 Jan. 1, 2014. Published January 2014. Originally approved in 1996. Last previous edition approved in 2007 as F1762–07. DOI: 10.1520/F1762-14.

[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.

8.1.1 Measure or observe the desired characteristics of the switch so that comparable measurements and observations can be made prior to, during and after the test. Some suggested values are:

8.1.1.1 Circuit resistance in accordance with Test Method F1680.

8.1.1.2 Capacitance in accordance with Test Method F1663.

8.1.1.3 Force displacement in accordance with Test Method F2592.

8.1.1.4 Insulation resistance in accordance with Test Method F1689.

8.1.1.5 Submersion in accordance with Test Method F1895 (for sealed switch only).

8.1.1.6 Visual inspection in accordance with Test Method F1595.

8.1.2 Connect predetermined switch terminations to resistance measuring device.

8.2 *In-Process Test:*

8.2.1 Place specimens in the chamber at ambient conditions, record time and date, and initiate measuring device.

8.2.2 Adjust the ramp rate to decrease air pressure at 2000 ft/min unless otherwise specified.

8.2.3 Set pressure at desired level from Table 1.

8.2.4 Maintain the chamber pressure for the one hour or a specified time interval.

8.2.5 Return chamber pressure to the initial ambient conditions at the specified rate.

8.2.6 Remove specimens and record time and date.

8.3 *Post Test:*

**TABLE 1 Pressure Level**

| Test Condition | Pressure – Maximum | | Altitude | |
|---|---|---|---|---|
| | Inches of mercury | Millimeters of mercury | Feet | Meters |
| A | 8.88 | 226.00 | 30 000 | 9 144 |
| B | 3.44 | 87.00 | 50 000 | 15 240 |
| C | 1.31 | 33.00 | 70 000 | 21 336 |
| D | 0.315 | 8.00 | 100 000 | 30 480 |

8.3.1 Measure and observe the characteristics of the switch as in 8.1.1. Record time and date for each characteristic measured.

## 9. Report

9.1 Report the following information:

9.1.1 Pressure level (from Table 1).

9.1.2 Time interval.

9.1.3 Ramp rate.

9.1.4 Temperature.

9.1.5 Humidity.

9.1.6 Change in measured or observed characteristics.

9.1.7 Any self-closure events that occurred during test.

## 10. Precision and Bias

10.1 The precision and bias of this test are under investigation.

## 11. Keywords

11.1 contact closure; delamination; membrane switch