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# Standard Practice for Exposing a Membrane Switch to Variation in Atmospheric Pressure<sup>1</sup>

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## 1. Scope

1.1 This practice 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:
- F 1570 Test Method for Determining the Tactile Ratio of a Membrane Switch<sup>2</sup>
- F 1597 Test Method for Determining the Actuation Force and Contact Force of a Membrane Switch<sup>2</sup>

#### 3. Terminology

- 3.1 Definitions:
- 3.1.1 *membrane switch*—a momentary switching device in which at least one contact is on (or made of) a flexible substrate.
- 3.1.2 *contact closure*—the point at which a specified resistance is achieved.
- 3.1.3 specified resistance—the maximum allowable resistance as a measure between two terminations whose internal switch contacts complete a circuit when held closed.

#### 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,

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  - <sup>2</sup> Annual Book of ASTM Standards, Vol 10.05.

- 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:
- 8.1.1 Measure or observe the desired characteristics of the switch so that comparable measurements and observations can be made during or after the test.
- 8.1.1.1 Document the setup, test equipment, and mounting procedure (if applicable) used to measure the characteristics.
- 8.1.2 Connect predetermined switch terminations to contact closure measuring device.
  - 8.2 In-Process Test:
- 8.2.1 Place specimens in the chamber at ambient conditions, record time and date, and initiate contact closure monitoring device.
- 8.2.2 Adjust the ramp rate to decrease air pressure at 2000 ft/min unless otherwise specified.
  - 8.2.3 Set pressure as specified.
- 8.2.4 Maintain the chamber pressure for the 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:
- 8.3.1 Measure and observe the characteristics of the switch as in 8.1.1. Record time and date for each characteristic measured.
- 8.4 For determining the tactile ratio of a membrane switch, test in accordance with Test Method F 1570.
  - 8.5 For determining the actuation force and contact force of



a membrane switch, test in accordance with Test Method F 1597.

### 10. Keywords

10.1 contact closure; delamination; membrane switch

#### 9. Precision and Bias

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

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