



Designation: F 1578-01

## Standard Practice for Designation: F 1578 – 07

### Standard Test Method for Contact Closure Cycling of a Membrane Switch<sup>1</sup>

This standard is issued under the fixed designation F 1578; 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 covers the setup, procedure, and apparatus required to depress and release a membrane switch to a predetermined number of cycles.~~

~~1.2 This practice also covers the optional use of specified voltage and current during the cycling of the membrane switch.~~

~~1.3~~

1.1 This test method covers the setup, procedure, and apparatus required to depress and release a membrane switch to a predetermined number of cycles.

1.2 This test method also covers the optional use of specified voltage and current during the cycling of the membrane switch.

1.3 This test method can be used in conjunction with other ASTM standards such as Test Method F 1596.

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:*<sup>2</sup>

D 2240 Test Method for Rubber Property—Durometer Hardness

~~F 1597 Test Method for Determining the Actuation Force and Contact Force of a Membrane Switch~~ F 1596 Test Method for Exposure of Membrane Switches to Temperature and Relative Humidity

F 1661 Test Method for Determining the Contact Bounce Time of a Membrane Switch

F 1662 Test Method for Verifying the Specified Dielectric Withstand Voltage and Determining the Dielectric Breakdown Voltage of a Membrane Switch

F 1689 Test Method for Determining the Insulation Resistance of a Membrane Switch

F 1663 Test Method for Determining the Capacitance of a Membrane Switch

F 1680 Test Method for Determining Circuit Resistance of a Membrane Switch

F 2592 Test Method for Measuring the Force-Displacement of a Membrane Switch

#### 3. Terminology

3.1 *Definitions:*

3.1.1 *actuation force*—the maximum force measured prior to or including the point at which contact closure is achieved on a membrane switch.

~~3.1.2~~ *contact closure*—the event at which a specified resistance is achieved.

3.1.3 *contact force*—the force at contact closure.

3.1.4 *duration*—the number of depressions and release cycles.

~~3.1.5~~

3.1.2 *duty cycle*—the ratio of switch closed time to total cycle time.

<sup>1</sup> 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 10, 2001. Published August 2001. Originally published as F1578-95. Last previous edition F1578-00.

<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 Membrane Switches. Current edition approved Dec. 1, 2007. Published December 2007. Originally approved in 1995. Last previous edition approved in 2001 as F 1578 – 01.

<sup>2</sup> 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.

3.1.6 *specified resistance*—maximum allowable resistance as measured between two terminations whose internal switch contacts are held closed to complete a circuit.

3.1.7

3.1.3 *test rate*—the number of depressions and release cycles per second.

3.1.8

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

#### 4. Significance and Use

4.1 Contact closure cycling is useful to manufacturers and users for determining the effect of repeated closing of switch contacts or the effect of repeated flexure of other switch components.

4.2 The characteristic(s) are measured before cycling begins and then again after cycling ends.

4.1 This testing is performed to determine the electrical contact reliability under switching conditions and the physical changes caused by mechanical actuation of the switch assembly in the environments in which the assemblies operate. Evidence of deterioration, that is, cracking of substrate, domes both metal and polyester, ink delamination, etc., resulting from this test can at times be determined by visual examination. However, the effects may be more readily ascertained by measurements made prior to, during, and after exposure. Total circuit resistance, force-displacement, dielectric strength, insulation resistance, and capacitance are types of measurements that show the deleterious effects due to exposure.

#### 5. Apparatus

5.1 *Suitable Electronic Monitoring Device*, to detect and count contact closure at a predetermined or specified test rate and duty cycle.

5.2 *Surface*, flat, smooth, unyielding, and larger than the switch.

5.3 *Test Probes*, built to either of the configurations shown in Fig. 1 or Fig. 2, are acceptable but must be made of an inert elastomeric material with a hardness number equivalent to A/45 ± 5 as measured in accordance with Test Method D 2240. Test probes that do not meet this criteria must be specified and recorded fully.

5.4 *Device*, which will cycle the probe repeatedly into and away from the switch at a specified test rate and duty cycle, and which is capable of providing means for counting probe cycles. The motion of the probe should be perpendicular to the plane of the switch.

5.5 *Power Supply*, capable of supplying specified voltage or current, or both, if required.

#### 6. Procedure

6.1 *Pretest Setup*:

6.1.1 Secure the switch on a test table.

6.1.2 Measure the desired characteristics of the switch so that comparable measurements can be made during or after the test.

6.1.2.1 Document the procedure and test equipment used to measure the characteristics.

6.1.3 Determine the actuation force ( $F_a$ ). (See Test Method F1597.)

6.1.4 Position the test probe over the desired area of the switch. Measure the  $F_{max}$  and  $F_c$  in accordance with Test Method F 2592 and any other desired characteristics of the switch as specified in Section 7 and record.

6.1.3 Position the test probe over the desired area of the switch.

6.1.4 Position the test probe until the tip is just above the top surface of the switch without touching.

6.1.5 Connect the switch terminations to the contact closure monitoring device, and power supply, if applicable.

6.1.6 Adjust the probe in the full-down position to achieve 110% of actuation force ( $F_a$ ) or to a specified force.

6.1.7 Set the power supply voltage or current, or both, to the specified values, if applicable.

6.1.6 Adjust the probe in the full-down position to achieve 110 % of  $F_{max}$  or  $F_c$  (whichever is greater) or to a specified force.

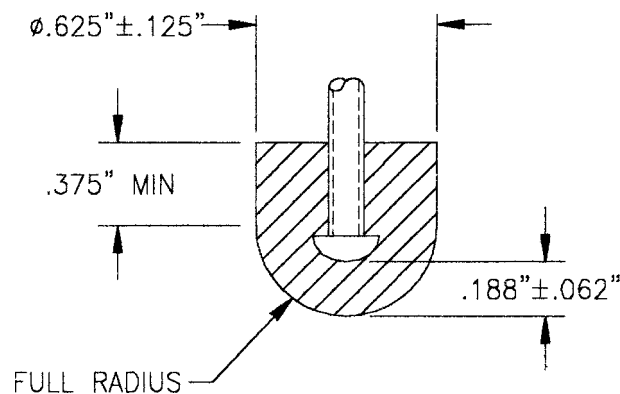


FIG. 1 Test Probe Option