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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Determining the Tactile Ratio of a Membrane Switch [1]

This standard is issued under the fixed designation F 1570; 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 the determination of the tactile response of a membrane switch as defined by tactile ratio.

1.2 *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 *contact closure (make)*—point at which specified resistance is achieved.

2.1.2 *contact force*—force at contact closure.

2.1.2.1 *Discussion*—ideal value for F_{min}

2.1.3 *displacement*—distance traveled by the surface in contact with the test probe.

2.1.4 F_{max} *(acutation force)*—maximum force measured prior to or including point at which contact closure (F_{min}) is achieved (see Fig. 1 and Fig. 2).

2.1.5 F_{min}—minimum force seen between F_{max} and point at which probe movement ceases.

2.1.5.1 *Discussion*—F_{max} can equal F_{min}. F_{min} is ideal location for contact closure.

2.1.6 *force-displacement curve*—relationship between force applied and displacement of a membrane switch.

2.1.6.1 *Discussion*—Usually expressed as a line graph (see Fig. 1 and Fig. 2).

2.1.7 *non-tactile switch*—a switch assembly that has a tactile ratio equal to zero.

2.1.8 *specified resistance*—maximum allowable resistance as measured bteween two terminations whose internal switch contacts, when held closed, complete a circuit.

2.1.9 *tactile ratio*—a measure of tactile response (see Eq 6.2).

2.1.10 *tactile response*—a sudden collapse or snapback of a membrane switch prior to contact closure or after contact opening.

2.1.10.1 *Discussion*—The amount of tactile response is determined by the equation shown in 6.2.

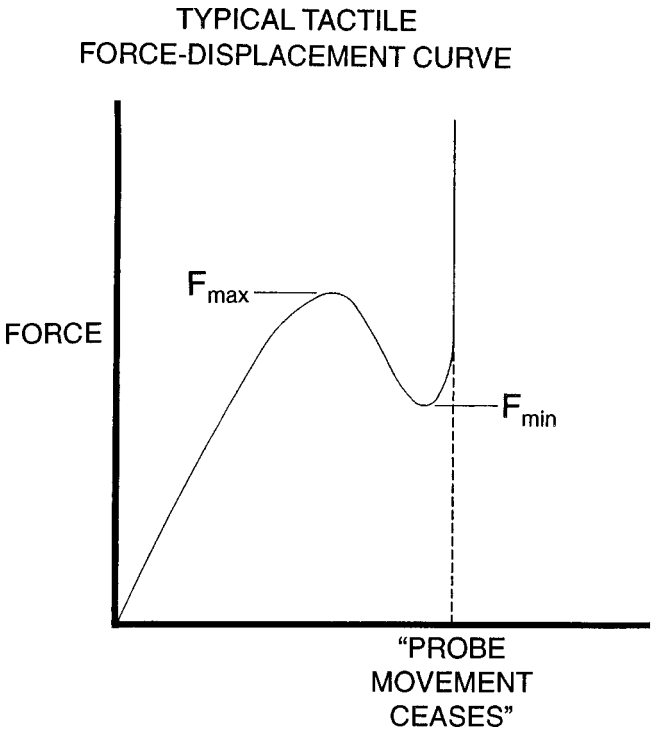

FIG. 1 Typical Tactile Force–Displacement Curve

2.1.11 *tactile switch*—a switch assembly that provides a tactile ratio greater than zero.

3. Significance and Use

3.1 The tactile ratio is useful in quantifying the feel of a membrane switch. Factors other than tactile ratio may affect the "feel" of a tactile switch.

3.2 Always report the tactile ratio as a function of measured F_{max}. This is important because it is possible to have the same tactile ratio for different values of F_{max}.

4. Apparatus

4.1 *Test Probe*, made of nonelastic material with shape and size to be specified.

4.2 *Device*, to hold probe securely and provide perpendicular movement into and away from switch under test.

4.3 *Monitoring Device*, suitable to detect F_{max} and F_{min}.

4.4 *Test Surface*, flat, smooth, unyielding, and larger than switch under test.

[1] This test method is under the jurisdiction of ASTM Committee F-1 on Electronics and is the direct responsibility of Subcommittee F01.18 on Membrane Switches.

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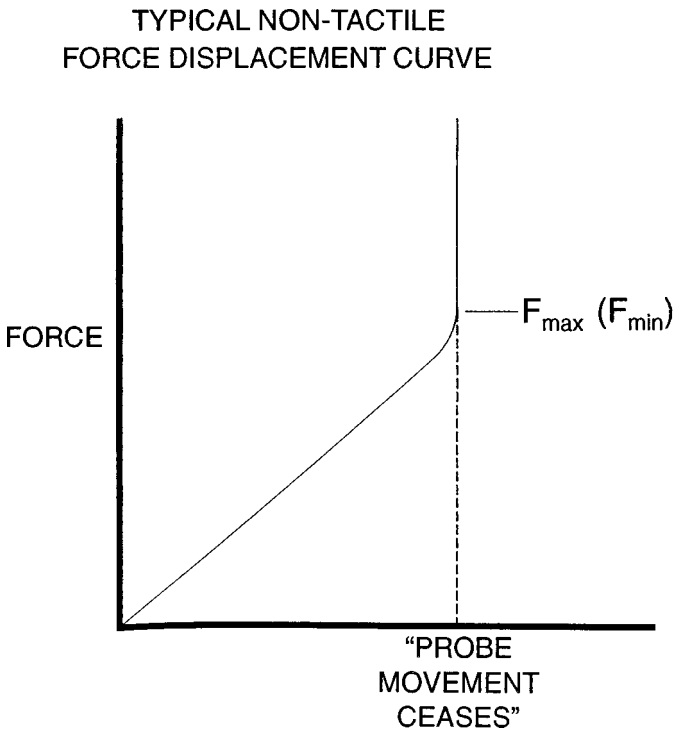

FIG. 2 Typical Non–tactile Force Displacement Curve

5. Procedure

5.1 *Pre-Test Setup*:

5.1.1 Secure switch on test surface.

5.1.1.1 Precondition switch by depressing manually 25 times.

5.1.2 Position test probe over desired area of switch.

5.1.3 Position probe until tip is just above top surface of switch without touching.

5.2 *In-Process Test*:

5.2.1 Begin by activating ttest probe movement down at a rate not to exceed 13 mm/s.

5.2.1.1 During downward probe movement record F_{max} and F_{min}.

5.2.2 Continue movement until probe movement stops or when force on probe is a minimum of 110 % of F_{max}.

5.2.3 Reverse direction of test probe until it is no longer touching the top surface of the switch.

5.2.4 Repeat 5.2.1 thru 5.2.3 four times.

6. Calculations

6.1 Determine the average of five readings for F_{max} and F_{min}.

6.2 Tactile ratio is determined by the following equation:

$$\text{Tactile ratio} = \frac{F_{max}(\text{avg}) - F_{max}(\text{avg})}{F_{max}(\text{avg})} \times 100$$

7. Report

7.1 Report the following information:

7.1.1 Temperature,

7.1.2 Humidity,

7.1.3 Barometric pressure,

7.1.4 Shape and size of probe,

7.1.5 $F\text{—}_{max}$ (avg),

7.1.6 $F\text{—}_{min}$ (avg),

7.1.7 Tactile ratio,

7.1.8 Description of probe holding fixture and monitoring device,

7.1.9 Part number or description of switch, or both,

7.1.10 Date of test,

7.1.11 Number of specimens tested, and

7.1.12 Force-displacement curve (optional—see Fig. 1 and Fig. 2).

8. Precision and Bias

8.1 The precision and bias of this test method are under investigation.

9. Keywords

9.1 membrane switch; tactile ratio