



Designation: **F 1596 – 9500**

## Standard Practice for Exposure of Membrane Switches to Temperature and Relative Humidity <sup>1</sup>

This standard is issued under the fixed designation F 1596; 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 a procedure for temperature and humidity cycling of membrane switches.
- 1.2 This practice is designed to determine changes induced by temperature and humidity.
- 1.3 This practice is not intended to be a thermal shock procedure; a gradual ramp rate between conditions is required.
- 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 Definition:

- 2.1.1 *membrane switch*—a momentary switching device in which at least one contact is on<sub>2</sub> or made of<sub>2</sub> a flexible substrate.

### 3. Significance and Use

- 3.1 Changes in temperature and humidity during shipping, storage or use can affect the visual appearance, mechanical integrity, or electrical functionality of switches. This practice simulates three different environments to which membrane switches may be exposed.
- 3.2 The three industry-recognized switch categories based on performance levels are Level 1, Level 2, and Level 3 (see section 7.1).
- 3.3 Additionally, there may be custom requirements that vary by application, therefore, these requirements can be determined by customer and vendor agreement and be established as a Level 4.
- 3.4 This practice defines the duration of a single cycle. Multiple cycles may be appropriate depending on the requirements of the application.

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#### 4. Apparatus

- 4.1 *Closed system*, with temperature and humidity control.<sup>2</sup>  
 4.2 The formation of condensation during rising temperature cycles is acceptable; the formation of ice during low temperature cycling is not acceptable.

#### 5. Test Specimens

- 5.1 The specimens shall be finished switches as delivered and mounted to an actual or agreed upon substrate.

#### 6. Conditioning

- 6.1 Condition all specimens for 72 h at 20 to 25°C (68 to 77°F) and 20 to 80 % relative humidity (RH) immediately prior to exposure, or prior to temperature and humidity cycling. This is to enable the specimens to stabilize.

#### 7. Procedure

- 7.1 Subject the preconditioned specimens to the exposure test cycle as illustrated in Table 1.  
 7.2 Return to room temperature and prepare for evaluation.

#### 8. Keywords

- 8.1 membrane switch; relative humidity (RH); temperature

<sup>2</sup> A closed system such as a Tenney T3ORC, Despatch EC 619, or Espec EMX, available from Tenney, Inc., Union, NJ 07083; Despatch Industries, Minneapolis, MN 55440-1320; ESPEC Corp., Grand Rapids, MI 49509, have been found satisfactory for this purpose.

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**TABLE 1 Exposure Test Cycle**

Level 1 [–40°C (–40°F) to 85°C (185°F)]	Level 2 [–25°C (–13°F) to 70°C (158°F)]
72 h at 85°C (185°F) <sup>A</sup> dry heat	72 h at 70°C (158°F) <sup>A</sup>
24 h at 38°C (100°F) <sup>A</sup> and 95 % RH <sup>B</sup>	24 h at 38°C (100°F) <sup>A</sup> and 95 % RH <sup>B</sup>
8 h at –40°C (–40°F)	8 h at –25°C (–13°F) <sup>A</sup>
40 h at 85°C (185°F) <sup>A</sup> —dry heat	40 h at 70°C (158°F) <sup>A</sup>
24 h at 38°C (100°F) <sup>A</sup> and 95 % RH <sup>B</sup>	24 h at 38°C (100°F) <sup>A</sup> and 95 % RH <sup>B</sup>
72 h at –40°C (–40°F) <sup>A</sup> —dry heat	72 h at –25°C (–13°F) <sup>A</sup>
Level 3 [–10°C (14°F) to 55°C (131°F)]	Level 4 (Custom Requirement)
72 h at 55°C (131°F) <sup>A</sup>	See 3.3
24 h at 38°C (100°F) <sup>A</sup> and 95 % RH <sup>A</sup>	
8 h at –10°C (14°F) <sup>A</sup>	
40 h at 55°C (131°F) <sup>A</sup>	
24 h at 38°C (100°F) <sup>A</sup> and 95 % RH <sup>A</sup>	
72 h at –10°C (14°F) <sup>A</sup>	

<sup>A</sup> (±2°C ± 3.6°F and ±6.0 % RH).

<sup>B</sup> Place these samples in a rack at a 45° angle to allow condensate to drain from samples and arrange to allow adequate air flow between samples.