



Designation: **F2865—11 F2865 – 13**

Standard Guide for Classifying the Degrees of Ingression Protection Provided by Ingress of Dust and Water into a Membrane Switch¹

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1. Scope

1.1 This guide establishes a classification system and references test methods for verifying the degrees of protection provided by a membrane switch against the following of:

1.1.1 The ingress of dust into the internal layers of a membrane switch.

1.1.2 Ingress of water into a membrane switch, or the entry into the finished product on which it is mounted the internal layers of a membrane switch.

1.1.3 It can be expanded to incorporate the degrees of protection from other environmental contaminants (such as salt fog) as these tests are developed either by ASTM, or existing test methods developed by other organizations are determined to be appropriate.

1.1.3 Where external test methods are referenced, this guide specifies the special conditions that shall be considered in applying these tests to membrane switches and how the results are interpreted.

1.1.5 The IP rating is based on the switch construction only and does not consider the effects of the switch body as a sealant for the enclosure.

1.1.6 For ingress of dust, numerals 5 and 6, the test is carried out according to category 2 (testing at atmospheric pressure).

1.2 This guide references appropriate test methods for verifying that a membrane switch satisfies the level of protection specified by a given classification that can be used to establish the ingress classification of a membrane switch.

1.3 This guide is a modification of the classification system described within utilizes the test methods and reporting structure of IEC 60529 – Degrees of Protection Offered By An Electronic Enclosure. (Degrees of Protection Provided by Enclosures) modified for membrane switches.

2. Referenced Documents

2.1 ASTM Standards:²

F1578 Test Method for Contact Closure Cycling of a Membrane Switch

F1595 Practice for Viewing Conditions for Visual Inspection of Membrane Switches

F1680 Test Method for Determining Circuit Resistance of a Membrane Switch

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

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

2.2 IEC Standard:³

60529 Degrees of Protection Offered by an Electronic Enclosure Provided by Enclosures

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

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

4. Classification System

4.1 The degree of protection provided by ingress classification of a membrane switch is designated by the **MS-IPMSIP** code:

4.1.1 **MS-A-IP-MSIP 6 5 A**

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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.

³ Available from International Electrotechnical Commission (IEC), 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, <http://www.iec.ch>.

4.1.1.1 **MSMSIP** = ~~membrane switch~~ Membrane Switch Ingress classification.

4.1.1.2 **A** = If “A” is present in code then method or media deviates from this standard.

4.1.1.3 **IP** = Standard Ingress Protection designation.

4.1.1.2 1st Numeral = Dust Protection Code (see Table 1).

4.1.1.3 2nd Numeral = Water (Liquid) Protection Code (see Table 2).

4.1.1.4 **A** = If “A” is present then method or media deviates from this guide and is reported.

4.1.2 The MSIP code comprises a series of numerals. Each numeral represents the level of ingress protection offered by the membrane switch to each contaminant. In this standard guide when addressing only the 1st or 2nd numeral the other numeral is replaced with an “X” for clarity. For example, MSIP X5 would refer refers only to testing for water ingress. The “X” notation is not used as a final designation. If testing is not completed a “0” is used for that numeral (see Table 1 and Table 2).

4.1.3 It is intended that the classification scheme be expanded by the addition of further numerals to the sequence to incorporate tests for other contaminants. Deviation from the standard are declared.

4.1.3 The numeric designations for dust and water are based on those classified under IEC 60529.

5. Significance and Use

5.1 Ingression protection classifications are widely used by manufacturers for specifying the level of protection offered by electronic enclosures.

5.2 An example of such a classification scheme is IEC 60529. Membrane switch manufacturers are often asked to meet these standards, however the test methods specified within these standards do not address considerations specific to membrane switches.

5.3 ~~A single classification scheme such as this is an important means of integrating the various standards that relate to ingress protection specifically for membrane switches. The MSIP classification system considers the membrane switch separately from the testing and IP codes used for classifying the enclosure when subject to similar test conditions.~~

5.4 Ingression testing can be useful to identify design deficiencies.

TABLE 1 1st Numeral = Dust Protection Code

Numerals or Letters	Meaning for the protection of	Requirement Summary	Test Equipment
0	Not tested or no protection	none	N/A
1,2,3	Not applicable to membrane switches	none	N/A
4	Solid objects (no venting to the locations outside the enclosure)	Internally vented only. Ingress of solid objects up to 1.0 mm and 1N; no entrance of the probe	1.0 mm diameter test pin Force gage
5	Dust protected	Ingress of dust is not totally prevented, but the dust shall not penetrate in a quantity to interfere with the satisfactory operation of the apparatus	IEC 60529 — Dust Chamber No pressure added to the chamber
6	Dust tight	No Ingress of Dust	IEC 60529 — Dust Chamber Positive pressure

TABLE 1 1st Numeral = Dust Protection Code

Numerals or Letters	Degree of Ingress	Requirement Summary	Test Equipment
0	Not tested or no ingress prevention demonstrated	none	N/A
1,2,3,4 ^A	Not applicable to membrane switches	none	N/A
5	Dust protected	Ingress of dust is not totally prevented. The switch operates as declared and the post-test circuit resistance change is less than +30 % of pre-test, and below the maximum circuit resistance as specified by the manufacturer.	IEC 60529 – Dust Chamber Category 2 – No pressure difference created in the chamber
6	Dust tight	No Ingress of Dust in the internal switch cavities. The switch operates as declared and the post-test circuit resistance change is less than +30 % of pre-test, and below the maximum circuit resistance as specified by the manufacturer.	IEC 60529 – Dust Chamber Category 2 – No pressure difference created in the test chamber

^AIP codes 1,2,3 and 4 are not applicable to membrane switches because they indicate a level of protection for objects of 50 mm, 12 mm, 2.5 mm and 1.0 mm diameter respectively.